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The Farmer's Digest

Volume 12 February, 1949 Number 9

On the Spot Farm Research

Condensed from Capper's Farmer

R. L. Foster

THE best place to solve a farm production problem is right where the trouble is found. On that basis, Iowa farmers and their state agricultural experiment station are doing "on the spot" research. Scientists don't have to say: "We think this will work on your farm because we have tried it out on the station here at Ames." They are finding out for sure by conducting experiments near where the farmer lives.

Iowa has 15 major soil areas and 250 soil types. Some land is good for corn and some only for grass. A good tillage practice for one area may be disastrous in another. Problems of the vegetable growers on the peat soils of Hancock county are entirely different from those on the silt loams in the rolling hills of southwestern Iowa. Conditions in these contrasting areas are not the same as at the main experiment station of Iowa State College at Ames.

However it is the job of the experiment station to help all farmers. Out of its effort to cover the state in the most practical way there is developing a system of outlying branch stations placed in problem areas. The land is locally owned or leased thru farmer associations. The research program is developed jointly by farmers and experiment station scientists.

How the plan works is best explained by describing one of the association farms, which is in Howard county. Soil there is black and rich-looking. But subsoil is tight and the land is hard to handle in wet years.

Howard county farmers needed help on drainage, soil management and wet-land crops. Since there is nothing else quite like

Reprinted by permission from Capper's Farmer
October, 1948, Topeka, Kansas

Howard county soil in Iowa, the logical spot to tackle the problem was right at home. A place where the research could go on uninterrupted for several years was needed. So 250 farmers bought a 120-acre farm. They raised the money thru sale of non-profit shares in the Howard County Experimental Association.

The farm was leased to the state experiment station for 10 years, at a rental equal to the annual taxes on it. Returns from crops and livestock go to the station. Upkeep and operating expenses are paid by the station. If additional buildings are needed the station may construct them.

If the experiments haven't been completed at the end of 10 years the lease may be renewed. When projects are finished, the farm will be sold and the money equitably divided between the association and the station.

Operation of the Howard county farm is in its fourth year. Farmers helped plan the projects and have a voice in the program thru an advisory committee.

Farmers of the area get a double benefit from the farm, whether or not they are stockholders. Recommendations that come out of the experimental work are available to all. Most important, they can see the work in progress. Hundreds of them attend the annual field days, inspect the crop-variety and fertilizer tests, see demonstrations in drainage and soil management and listen to station soils and crop specialists explain how results may be applied to their individual farms.

Farmers in rolling country east of the Missouri river have a different set of problems. Erosion is their biggest worry. They want research in grassland farming, terracing, soil management, crop rotation and tillage methods. Commissioners of the soil-conservation districts in 4 counties formed the Western Iowa Experimental Farm Association. They sold memberships to 800 persons and bought a 240-acre farm in Monona county. The experimental program is in its second year.

Orcharding, once a 1200-acre industry in 6 southwestern Iowa counties, may be shown the comeback trail thru the Bluffs Experimental Fruit Farm, owned by the Southwestern Iowa Horticultural Association. The Armistice Day freeze of 1940 finished off the commercial orchards in western Iowa. The search is for hardier and more-productive varieties. Sixty apple varieties, plus grapes, pears, peaches, plums, bramble fruits and strawberries, have been planted in the test blocks of the 105-acre farm.

Similar plans of decentralized

experimental work have saved the melon- and truck-growing industry that was threatened at 2 points in eastern Iowa. In those instances growers' associations rented land and turned it over to the experiment station. Work with sugar beets and other crops has been under way on a farm owned by the Northern Iowa Experimental Association in Hancock county since 1930.

An outstanding branch station in Iowa is the Soil Conservation Experimental Farm in Page county. There the farm is owned by the experiment station and projects in cover crops, tillage methods, soil and water losses, rotations and pasture management are conducted co-operatively with the Soil Conservation Service. Experiments in pasture management and grass mixtures for southern Iowa are conducted at a pasture experimental farm in Monroe county.

Agreements between experimental-farm associations and the state experiment station are in process at several additional Iowa points. In some areas only the selection of a typical farm remains before the program can be started. State experiment station officials hope eventually to have test farms in each major soil area.

It is not expected that the association farm plan will supplant the established state-owned experiment station farms. Neither is it intended that the co-operative crop-variety and fertilizer test plots placed with individual farmers in various parts of the state will be discontinued.

Basic work in plant and animal breeding, feeding, plant and animal diseases and development of improved crops and livestock are conducted at the main experiment station at Ames. A 1,700-acre tract near Ames, released by the War Assets Administration, has been acquired recently by the experiment station. This land will give the station room for expansion of its animal-breeding research. Additional acreage will also benefit Iowa farmers by permitting the station to increase seed of improved crop varieties more rapidly.

The plan of association-owned farms permits the state experiment station to work where the research is most needed without making a big investment in land. When a job is done in an area, it can withdraw and help another territory. Farmers like the plan because they can see the research work in progress in their own communities.

A Barn That Saves Labor

Condensed from Better Farming Methods

R. C. Handley
Doane Agricultural Service

HERE is a barn that is designed to work as do other farm tools. Yet, it can be built for one-half the cost of barns of equal size.

The Doane low-cost pole barn is the result of 26 years in designing, building, using and rearranging farm buildings. It is the result of asking questions like:

1. *How can we use less of today's high cost lumber and material?*
2. *How can we use less of today's high cost carpenter labor?*
3. *How can we adapt it to today's machine-farming?*
4. *How will it fit into one-man farm operations?*
5. *How will it preserve plant nutrients in manure?*
6. *How well will it protect high priced crops and livestock?*
7. *How is it adapted to sanitary measures to prevent diseases?*
8. *How will it save today's high cost farm labor by saving steps and saving work?*

This barn has been designed not only to reduce labor during year around use, but also to reduce labor during construction. A 50 x 56-foot barn was built in 1946 for $1,380.20. Conventional construction of the same capacity barn would have been at least $3,500.

Any pair of men that can build a board fence can construct this type of barn. For them to do this they must forget custom, tradition and old standards of construction.

Here are ten ways to save labor and materials in the construction of this low-cost barn:

1. Foundations and double construction of forms are eliminated by use of poles which are set like fence posts. Not saplings, but poles chemically treated under pressure. The best information available indicates that treated poles will last at least forty to fifty years.

2. There is no need for excavating and little ground leveling is necessary, especially if the barn is placed on reasonably level ground.

Height of splash boards can be varied to make up for slight differences in elevation.

3. The poles eliminate the need for usual framing within the building. They take its place. Once the

Reprinted by permission from Better Farming Methods
December, 1948, Mount Morris, Illinois

poles are tamped into place, the rafter supports are leveled at the plate line and the construction remaining is simple nailing of the rest of the structure.

4. The design of the building is kept low to the ground so that it is not necessary for double construction of scaffolds which take time to build and to tear down. Ordinary ladders are all that are necessary.

5. Practically all bracing is eliminated because the poles are rigidly anchored. The remaining building is supported by, and tied down to them, thus making bracing unnecessary except to help support the rafters in areas where there are heavy snow loads.

6. All storage is at ground level in this barn. By eliminating the loft, much of the heavy bracing and framing material is left out. This also cuts down erection time.

7. Ventilation is taken care of automatically and this saves cost. The whole south side of the barn can be left open to give the structure one of its most desirable features. For healthy, thriving livestock, *the inside temperature should be close to the outside temperature*. This is especially true for cattle and sheep. Livestock on full feed must give off heat as a by-product. When they are enclosed in tight buildings, their gain or production is often reduced.

8. Notching and sawing of lumber is reduced to a minimum. It takes time to notch framing and notching often reduces the strength. Sawing of rafters is eliminated by allowing them to lap. Even at the ridge they lap together doing away with cutting a difficult angle. Nail ties along the side walls lap so that there is no sawing, thus saving erection time.

9. Many pieces of material have been eliminated while others do double and triple duty. This reduces material from one-fourth to one-third. Every piece going into the structure has been questioned to make sure that it has a purpose and that it is doing its full share of work.

10. Labor costs are reduced in two ways; first in overall reduction of time and second by using unskilled labor. This is made possible by elimination of notching. sawing, construction of forms, cutting of rafters and other such detail work.

The saving of labor during construction is just a "drop in the bucket" compared to the labor saved every day the barn is used. The following features help to save labor during the whole process of moving feed and bedding to the barn, feeding the livestock and hauling manure back to the fields.

1. The "Doane Drive-Through" principle is used so that hay racks, sleds, buckrakes or trucks can be driven into the stor-

age area and the hay unloaded right where stored. The low built structure makes it unnecessary to hoist bales to a great height. Special attention was given to develop this barn for storage of baled and chopped hay.

2. There are no lofts to climb into, no lugging of hay to hay chutes, no hay chutes for hay to catch in, no redistribution of hay after it is thrown down. Simply roll the hay off over into the feed manger. Bedding is also stored right where it is ready for use—it can be tossed over the manger into the loafing areas.

3. The interior fixtures are movable like those in a house. The pole framing reduces interior supports to a minimum, yet provides a strong, substantial shell easily adapted to any arrangement. In many cases the poles are just the thing to temporarily fasten the movable bunks, mangers and partitions.

4. Ample clearance has been allowed for use of power manure loaders and other equipment. This considerably reduces the labor required to do one of the most back-breaking of all farm jobs. Power equipment also helps to insure manure removal at a time when labor loads are at their peak.

Simple Way to Figure Hog Production Records

If you want to get production records on your hog business, here are five simple ways to list them:

1. **Number of live pigs born to each sow.**
2. **Number of pigs weaned per sow.**
3. **Rate of gain per litter.**
4. **Cost of that gain.**
5. **How they sell on the market.**

It takes a little more work to keep the records and weigh the pigs. However, when you get done, you've got a real record that tells you which pigs to save for breeding stock. It also puts a finger on the cause of your trouble if you aren't having good luck.

It's farm work like this that puts extra money in the pocket book.

—Farm Journal

Shipping Fever

Condensed from The Eastern Breeder

True Davis, Jr.

MANY a stockman, having bought very favorable looking feeder stock, has gone to bed thinking of the profit these likely looking cattle are going to bring him. Upon arising, he goes to take a look at his new stock and notices several standing apart from the others and refusing to eat. Thinking this is probably due to the rigors of the trip from the stockyards to his farm, he goes on about his business for the day. The next time he looks into the feed lot, he believes something is actually wrong, for now his few cattle, which had earlier refused to eat, really look sick. A watery discharge from the eyes and nose has started and saliva is frequently dripping from the mouth. Our stockman friend, at this point, wonders what could be wrong, for although the cattle had been vaccinated with hemorrhagic septicemia bacterin at the stockyards where they were purchased, they are showing every well-known symptom of the dreaded disease hemorrhagic septicemia, the so called "shipping fever" or "stockyards fever."

Approximately $1,000,000 worth of livestock die each year in the United States from what is commonly known as "shipping fever" and it is estimated that 80 per cent of these deaths are caused by the owners of these animals not clearly understanding the fundamental means of practical protection and the principles of immunization.

Hemorrhagic septicemia ("shipping" or "stockyards fever") is a very contagious disease affecting cattle and other livestock under various conditions and at various times of the year. The disease is usually fatal and affected animals show elevations in body temperature from 104 degrees to 108 degrees F. This disease was given the name of hemorrhagic septicemia because hemorrhages are produced in the animal's system along with a septicemia, or poisoning, of the blood. The organism responsible for this disease in cattle is Pasteurella boviseptica and is generaly found in the nasal and respiratory passages of all animals. It is only when the animal's resistance is lowered, due

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October, 1948, Warrenton, Virginia

to abnormal conditions, that this organism becomes fully virulent and the animal will then readily contract the disease. Younger animals are usually more susceptible than older ones, particularly calves, immediately after they have been weaned. Hemorrhagic septicemia in both cattle and sheep is usually complicated by other secondary invaders such as diphtheroid, staphylococcus and streptococcus infections. These secondary invaders tend to further lower the animal's resistance, making the path easier for the Pasteurella organism.

During the fall months of the year the disease is most prevalent, for it is usually at this time that cattle are shipped from the grass ranges into the feed lots of the country for winter feeding. While the animal is in the process of transportation the important factors of exposure, handling, and feeding all play an important part in bringing about ideal conditions for the contraction of the disease. It is well, therefore, to see that the animals are given proper rest and are not exposed to over-chilling or over-heating. The practice of not watering cattle until they reach the purchaser, so advantage may be taken of an extra fill in weight, is quite detrimental because it is difficult for the animal to regain its normal condition after being without water for so long a period. Care should be taken in purchasing any animals that show excessive signs of a large water fill for it will take some time for these animals to return to normal, thereby increasing their susceptibility to the disease. Upon arrival at the final destination the animals should be given a fill of dry roughage and a normal amount of water before they are put on heavy feed. These preliminary precautions should be followed quite conscientiously in all instances where animals have been shipped through contagious areas where they may very easily contract the disease.

In the field of biological immunization against hemorrhagic septicemia there are two products that may be used to bring about immunity in an animal's system.

Hemorrhagic septicemia bacterin is the most common product used and every stockman should have a complete understanding of the merits of the product. This bacterin is made from chemically killed Pasteurella organisms and when they are injected into an animal's system, due to the fact that they were previously killed, they can do no harm to the animal. The presence of these organisms, however, does set up an active immunity in the animal's system by causing the animal to produce a number of active antibodies to combat any further introduction of these disease germs. This process takes approximately

10 to 14 days before a sufficient number of these active antibodies can be produced to make the animal immune to the disease. At any time during this 14 day period the animal may contract the disease since there is no protection in the animal's system against such up to this time. The animal will usually die from hemorrhagic septicemia if contracted during this period, showing the usual symptoms due to the fact that the antibodies offering protection in the animal's system have not yet had a chance to be produced in sufficient numbers to prevent infection. If this bacterin is to be used in immunizing an animal, it should be ascertained that the animal has been vaccinated with this product at least 10 to 14 days before being moved or transported through a contagious area. The animal being in a weakened condition due to transportation, lack of rest, feed and water, and probably being subjected to rough handling, is particularly susceptible to hemorrhagic septicemia at this time.

The other product used for prevention of hemorrhagic septicemia is a serum that is made from the blood of animals that have been previously hyper-immunized against the disease. This blood, when made into serum, has a large number of passive antibodies in such number that they will combat this specific disease immediately upon administration to the animal's system. In the production of this serum the blood is refined by the separation of all corpuscles, leaving only the clear amber fluid known as serum, in which are found the disease combating antibodies. A chemical preservative is added and the serum is then filtered and freed of any contaminating bacteria and tested for potency. After a satisfactory potency test the serum is bottled and ready for use. When this serum is introduced into an animal's body it immediately protects the animal from hemorrhagic septicemia, for the serum is composed of antibodies already formed to combat the disease. However, these antibodies are passive and will gradually be dissipated in the animal's system. In other words, hemorrhagic septicemia serum is only effective from two to three weeks after administration. It should be carefully brought to mind the difference between the bacterin and the serum, remembering that the bacterin will not take effect for two weeks, while the serum is good for only two weeks.

Animals being shipped long distances, or being moved through stockyards, should by all means be vaccinated with both the serum and the bacterin. The serum protects them while they are in

transit, and the bacterin protects them after they reach the feed lot or farm—their final destination. The serum offers protection until active antibodies are produced by immunization with the bacterin. If there is any doubt whatsoever in the stockman's mind as to whether his animals have been immunized against hemorrhagic septicemia, a liberal quantity of hemorrhagic septicemia serum should be administered. However, in the case of the stockman who has raised his own stock and does not contemplate transporting such through contagious areas the bacterin would be more desirable for it will give immunity at a much lower cost than the serum.

Anti-hemorrhagic septicemia serum is also of great importance in the treatment of livestock which have already contracted this disease. In all cases where an animal is believed to have hemorrhagic septicemia a very liberal quantity of serum should be administered immediately. The antibodies present in the serum are ready to start immediate action to combat the disease germs and the noticeable improvement in the animal's condition will come about so fast it will seem phenomenal. There are several points to keep in mind in using serum to insure successful vaccination. Anti-hemorrhagic septicemia serum is obtained from the blood of both cattle and horses previously hyper-immunized against this specific disease. Depending on which type of blood, it is known as either "bovine" or "equine" origin. The blood of horses and cattle does not have the same physiological properties and it is important to remember when vaccinating cattle that serum of "bovine" origin be used, while the "equine" origin serum should be used on horses. This may possibly be made more understandable by remembering that human beings have different blood types and great care is taken before blood transfusions are given to ascertain that both types of blood are alike. It is for this reason that both "bovine" and "equine" serums are produced.

There is nothing difficult about vaccinating any animal and it is particularly recommended to all owners of valuable horses and show animals to vaccinate them with a very liberal quantity of anti-hemorrhagic septicemia serum before they are transported from one place to another. There is no other form of insurance with such a low premium.

Too much serum can never be administered to an animal. It is far better, and less expensive in the long run, to vaccinate an animal with more than is needed, than to use not enough and take a chance.

Are You Wasting Fertilizer?

Condensed from Successful Farming

Jim Roe

To GROW, a plant needs four things: light, air, water, and minerals. Of these, fertilizer supplies only minerals. And only a portion of the quantites needed. Tho that portion has tremendous importance, it can't cancel out the lack of any one of the other growth-limiting factors. Many crops actually run out of air or water long before they run out of minerals.

It's no news to you that your fertilizer bill has become one of your biggest cost-of-operation items. Used correctly, it can make you a lot of money. Used wrongly, it's money wasted.

Here are the five main causes of wasted fertilizer, and what to do about them:

1. *Wrong analysis.* Last season, Illinois farmers shelled out 5 million dollars for fertilizer their land didn't need. In some cases, charges the University of Illinois' Dr. Roger Bray, they applied fertilizing materials their particular soil wouldn't need for another 50 years.

He has some pretty impressive evidence to back up those figures. Illinois does more soil testing than all the rest of the Cornbelt put together. In 1947, soil from 800,000 acres was tested. The tests showed that 75 percent of the land needed phosphate. But, because not all Illinois farmers had their soil tested, 20,000 farmers used phosphate that year simply because they guessed their farms needed it. And with the 800,000 tested acres scattered all over the state, it's safe to take the 75-percent figure, and apply it to the 20,000 untested farms.

Thus, we find that 5,000 farmers—in that one state in that one year—used 100,000 tons of rock phosphate where it wasn't needed. The figures for limestone showed the same thing.

This is one of the biggest weaknesses of present-day fertilizer use. Unless you have your soil tested, you can only guess at which fertilizing elements it lacks. Most states don't offer as handy a system of soil testing as does Illinois, but in practically all of them your county agent or state agricultural college will test it for you free, or for a very small charge. Also, commercial testing services are available at reasonable fees.

Reprinted by permission from Successful Farming
December, 1948, Des Moines, Iowa

Applying fertilizer by guess wastes fertilizer. Even more important, it often makes you think you're solving your problems when you really aren't. This costs you heavily in yield. Sample and test your soil now, before ordering next spring's fertilizer.

2. *Poor soil structure.* No amount of fertilizer will make a tight soil loose. And a tight soil robs plant roots of air, as well as water. In central Indiana, 22 farmers added from 600 to 1,000 pounds of 8-8-8 to their soil. Because of the soil's poor tilth, only about 8 got enough yield increase to pay for the fertilizer cost.

If they had combined their fertilizer with a structure-building legume, the story would have been different. Dick Wickfield tried it, on his farm near Romney, Indiana. On land where he applied nitrogen alone, his corn went about 60 bushels to the acre. But on similar ground, with the same amount of nitrogen, but with sweet clover plowed down, the yield was 100 bushels.

A soil in good tilth can absorb and store several more inches of rainfall than can a tight soil. And Purdue tests have shown that a single extra inch of water can mean up to 29 extra bushels of corn from a single acre. We are steadily finding that soil structure is one of the most important keys to high yields. If your soil is tight, no amount of fertilizer will coax good crops from it. Loosen it up with grasses and legumes.

3. *Erosion.* If the soil itself washes off your fields, what makes you think fertilizer will stay long enough to do any good? Limestone spread on an unprotected hillside only helps neutralize the acidity of the nearest river. And it's false economy to let the topsoil wash away, then try to add enough fertilizer to bring up the fertility of the subsoil.

Before you go in for heavy fertilization of sloping land, make sure the land will still be there at the end of the season. Grassed waterways, contour- and strip-farming will help, and structure probably will be the biggest help. A soil in good tilth can stick on a sidehill long after a tight soil washes away.

4. *Poor drainage.* A poorly drained soil cuts off the roots' air supply, and keeps the soil cold later in the spring. Because soil microbes can't work in wet land, they will be unable to release soil minerals to the plant. The result? You may as well stay at the barn until you decide to tile or ditch the wet spots. Until then, your time, gasoline, and fertilizer will be thrown away.

5. *Fertilizing the wrong crop.* Most of us try to use as little fertilizer as we think we can, and still get highest yields. And, since corn and other row crops are the cash crops, we often toss all the ferti-

lizer on the corn crop, little or none on the meadows and pastures.

Actually, that's just backwards. If you're only going to use a limited amount of fertilizer, the best place to put it is on the meadow, with a small starter dose to the corn.

Here's why: Fertilizer applied to the clover crop can help grow a lush stand of the legume. Since the legume takes nitrogen from the air to build extra fertility, your fertilizer actually acts as a pump-primer, and the legume as the pump, fixing fertility free.

It showed up in an Indiana tomato field, too. A grower there decided to apply absolutely no fertilizer to his field of cannery tomatoes, with the small exception of the starter solution to the plants. The cannery's fieldman became a mighty worried man, for tomatoes like lots of fertility. But the grower went ahead and put all the fertilizer he would have used on the tomatoes, on the sweet-clover crop the year before.

In true storybook style, that tomato field topped the district, with 19.8 tons to the acre!

This grower had discovered the real key to the secret of how to get the most out of fertilizer. Sadly enough, most of us haven't yet followed his example. We must realize that fertilizer is only *one* tool, and that it won't work unless all the other limiting factors are removed, too. The better condition your soil is in, the more fertilizer you can use at a profit.

Successful Steer Feeding Experiment

Condensed from the Rural New Yorker

Thomas H. Wittkorn

In Lancaster County, Pennsylvania, steer feeding is traditional; practically every farm has from one to 100 feeders for some period during the year. A traveler through the county would not realize it because very few of the steers ever get out on pasture. The basements of the big barns, for which the county is famous, are the beef factories.

Since their dad, William Sangrey, used to feed steers, it was only natural, when the two sons, John W. and William W. Jr., in 1944 took over their father's farm of 127 acres, three miles southwest of Millersville, that they

Reprinted by permission from The Rural New Yorker, December 4, 1948, 333 West 30th Street, New York City

should do the same thing. But they are using a different system, and they believe that if more farmers would copy them, they would make more money. Their idea is to feed practically the year around instead of from November to April as is the general practice. As proof of their belief they point to the carload of 27 steers which they put in the barn last February at a total cost of $6,989.77, slightly over 30 cents a pound, and which they sold in August for 38¾ cents a pound, or a total of $12,069.14. Then on September 17 last they bought another lot of 45 head for $13,-596.65 which they are now feeding with the idea of selling them sometime after Christmas when the market recovers from its poultry meat holidays. The brothers buy and sell all their steers through commission men in the Lancaster stockyards which is the largest livestock market east of Chicago.

Both John and William believe that it pays to start with the best feeder steers available, weighing from 700 to 1,000 pounds each, with deep, blocky bodies and big middles. They prefer high grade Herefords or good Shorthorns. "When you are paying 30 cents and more a pound liveweight for cattle to fatten," John remarked, "you want to be sure they are good, because the better they are, the more gain you will get from each pound of feed they eat."

The reasons for fattening cattle, aside from the profit to be made, are to have a market right at home for the farm products and to provide needed fertility for the tobacco crop. So, let's see how their 127 acres were cropped this year: 35 acres were in barley, 25 in corn, 15 in wheat, 15 in clover hay, 11 in tobacco and the remaining 26 acres comprised the farmstead, woodland and pasture. There is only one dairy cow kept for home milk production. As to the yields, the barley averaged 65 bushels to the acre, wheat made 35 bushels, and on our visit in the Fall, the corn looked as if it would make the usual 100 bushels to the acre. All of the hay and straw are harvested with a pick-up baler; this year it amounted to 4,000 bales, 60 to 70 pound bales for the hay and 40 to 50 pound bales for the straw, twine bound, for the main harvest. Second cutting of the clover-alfalfa gave another 500 bales and a third cutting added 360 more. The tobacco yielded about the same this year as it did last but the quality was far superior. This was the first time for three years that hail had not left its mark on the farm's tobacco. Just what the cash return for it will be cannot be known

until after it is processed this Winter and sold next Spring, but it is no secret that the farm's 15 acre crop in 1947 sold for considerably over $9,000 last Spring.

The big barn, according to a diamond shaped white stone set into the wall, was built in 1869 by Abraham and Elizabeth Kendig, who owned the farm at that time. It measures 107 by 60 feet and is a typical Lancaster County bank-type barn with an eight foot overhang on the stable side, which provides a dry sheltered passage from door to door in rainy and Winter weather. There are two barn floors, ground level entrances on the opposite side of the overhang, with large mow space between them. In the basement where the steers are kept, there are no partitions, just the necessary post supports. There is a 16 foot long feeder open on both sides for the steers to eat out of at will as they roam free. There is also a hay rack for them to get a nibble at when they want it, but the 27 in there during the past Summer ate only about a bale of loose hay a day.

Their grain feed is prepared on the barn floor over the feeder. A mill is used for about 15 minutes to grind their feed, and it is powered by a tractor, which delivers about 35-hp. on the belt. Shortly before the steers were sold, a feed mixture for them was made with nine bales of good clover hay, 500 to 600 pounds; eight bags of barley, about 700 pounds; 400 pounds of cob-corn; 200 pounds of 25 per cent protein supplement; 100 pounds of flax screenings, and seven to eight pounds of salt. These proportions were changed from time to time according to the weather and the appetite of the animals, but the main thing is to note the large use of home grown feeds.

In making the mixture one man shovels the grain into the mill and another feeds it the hay. The resulting mixture forms a pile on the barn floor. The protein concentrates and the salt are mixed into it with a shovel as the pile is pushed into a 16-foot opening of the base board directly over the feeder in the basement. There have been times when more than 100 steers have been in the basement at the one time and this feeder supplied all of their grain. A watering trough six feet long is in the basement so that steers can drink from either side when they are thirsty. An automatic float valve controls the water so that the supply is constant and fresh. They are also allowed salt as desired, at all times.

When a new lot of steers is started on feed, they are given a generous amount of hay in the rack; a larger proportion of hay is ground into the grain mixture.

As soon as it is evident that the animals have no shipping sickness, their real feeding begins. The present 45 steers, from Kansas, do not seem to know what a man is on his own feet. On a tractor or a horse, John can mingle with them in the pasture but can get nowhere near them on foot. They are gradually being worked into the barn for feed but at the end of two weeks all of them had not been in at the same time. Usually the steers come from Virginia, West Virginia or Tennessee and these are easier to stable. In the barn plenty of clean straw is used for bedding, indeed all of the straw grown on the farm, and 25 tons more, which are bought each year, eventually finds its way down there. During the Winter about 40 pigs run with the steers in the basement. The manure is taken out whenever it has accumulated enough to notice low headroom. That is when the farm's especially equipped Caterpillar tractor does its good work. Father Sangrey bought it new some years ago but when the boys took over, they had a special hydraulic lift manure fork built onto it, and it goes right into the basement and cleans it out in no time. If conditions are favorable, the manure is dumped into a spreader and hauled directly to the field; otherwise it is dumped in the barnyard. When taken out to do custom work, the "cat" will load fast enough from a pile to keep four or five spreaders going. At home the steers and hogs make enough manure to cover 50 acres of the farm each year. All of the corn and tobacco ground is always given eight to 10 spreader loads to the acre.

The farm is now completely mechanized since the two tobacco cultivating mules were sold this year and a new light tractor bought to take their place. In all there are four tractors which now provide the power needed. A self-propelled combine was also added this year, and about 100 acres were harvested with it. Being able to take care of their own jobs with the best of equipment, and having no evening chores to call them home at a specified time each day, both of the brothers do considerable custom work for neighbors.

Besides the big barn, the farmstead has two modern dwelling houses, two big tobacco sheds and other smaller buildings—everything kept in tip-top shape. All the buildings, for instance, were recently given a coat of white paint at a cost of $2,000. Good management of this tidy farm permits this family to enjoy the rewards which come from intelligent and honest toil with the soil of Pennsylvania.

Up to $5,600 an Ounce

Condensed from Science Counselor

Robert J. Zoller

PACKAGING is one of the major problems of the seed business.

As we walked around the big plant the superintendent explained the difficulties.

"You can see what we're up against," he told me. "There are nearly 2,000 different seed varieties, and all have to be put into packets. One kernel of seed corn is probably 20,000 times the size and weight of a single petunia seed. Obviously we can't devise one kind of machine to package all our seeds."

He showed me one of the packaging machines in action. "Look at this stuff." he said. He held out a handful of small feather-like seeds. "Marigolds. They're so light they won't drop down as they should. They clog the machines."

Flower seeds, I learned, are particularly difficult to package. The machines measure out most seeds either by weight or by volume. The more expensive seeds—petunias, double snapdragons, cyclamen, or even such high-priced vegetable seeds as hybrid tomatoes—are sold by actual count.

"You mean somebody has to sit down and count out 50 seeds to the packet?"

The superintendent nodded. "We have a counting device that works on some seeds. But with anything as valuable as our new petunia seed—Mrs. Dwight D. Eisenhower, for example, or Colossal Shades of Rose—we have to be exact. We count them by hand. Valuable stuff."

"Like gold dust?"

The superintendent smiled. "Gold is worth about $35 an ounce, isn't it? This Mrs. Eisenhower, our most valuable seed, retails at $2 for a packet of 100 seeds. The stuff is so small it runs about 280,000 seeds to an ounce. You figure it out."

I did. "Why, that's $5,600 an ounce!"

I asked why seed should cost so much. I was told, that like anything else, the price of seed depends on a number of factors—production costs and other expenses, quantity available for sale, and demand. With the new all-double petunias production costs are extremely high because every seed is an F_1 (first generation)

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hybrid, the result of hand pollination. But even at necessarily high prices the new petunia seeds really sell. The flowers are magnificent and everyone wants to be the first in his neighborhood to grow them.

Much of the improvement in flowers and vegetables has been accomplished by what is known as special selection. Certain plants, whether mutations ("freaks" with characteristics which breed true) or just specially desirable specimens, are selected for seed, and only the finest, healthiest specimens are saved from generation to generation until all the seeds produce uniform plants with the desired traits.

W. Atlee Burpee used to travel 30,000 miles every summer visiting trial grounds and private gardens in his search for good plants, ready-made by nature. His plant hunting paid dividends. The senior Burpee introduced such long famous varieties as Spencer sweet peas, Bush lima beans, Rocky Ford muskmelons, Danish ballhead cabbage, Iceberg lettuce, Golden self-blanching celery, Red Ball beets, Golden Bantam sweet corn, and many others.

David Burpee, too, started out as a plant hunter but soon became impatient. "Hunting for mutations," he said, "is too slow. It will be better if we can make our own." Instead of hunting new varieties of flowers and vegetables he took a page from the book of Luther Burbank and started building them to order, catering to the latest whim of the housewife, shipper, or canner.

His method is crossbreeding and hybridization, combining the desirable characteristics of several plants into one variety. He and his plant scientists crossbreed hundreds of flowers and vegetables to make them bigger and better, prettier, more hardy, earlier, better tasting, or whatever they think will improve the strain. Some modern varieties are so improved they would not recognize their own grandparents.

Some of Burpee's greatest successes have been in the field of F_1 hybrids. Hybrid corn, of course, has been on the market for a number of years, producing bigger crops, which mean more food for consumers and bigger profits for market growers. Producing the seed for hybrid corn, however, is comparatively simple because the wind does the work of cross-pollination. But with such vegetables as tomatoes and cucumbers tedious work must be performed by hand, and must be repeated every year, and it has always been considered too costly to be practical.

In 1944, David Burpee decided to try it anyway. He hired 60 girls from Smith, Vassar, Bryn Mawr and other colleges to spend the

summer hand-pollinating tomato blossoms on his Fordhook Farms. The resultant seed produced an extremely heavy yield of large, rich-flavored fruits, comparatively high priced but tremendously popular among both market growers and home gardeners. Fordhook hybrid tomatoes, along with Burpee hybrid cucumbers, were offered to the public for the first time in 1945. Since then three more hybrid tomatoes and a new hybrid eggplant have been added. All have become "best sellers." The hybrid, says Mr. Burpee, is here to stay. In many localities under widely varying conditions the hybrids have led all standard varieties in size, quality, and yield per acre.

Another development in the seed world is even newer than hybridization, and a great deal more spectacular. In 1940, David Burpee put into practical commercial use the scientific experiments of a Carnegie Institute geneticist, Dr. Albert Francis Blakeslee. Dr. Blakeslee was using the drug colchicine, derived from the root of the autumn crocus, to double the chromosomes in the germ cells of plants and produce sharp changes which bred true. In some varieties plants changed so much they were barely recognizable. In others, however, the primary characteristics were retained, and the rate of growth increased. Color became intensified; flowers grew larger, bloomed longer and were generally improved.

The first colchicine-produced variety was a tetraploid (double-double) marigold. Two years later Mr. Burpee achieved somewhat similar effects by the use of X ray. He introduced two new calendulas which he called his X-ray Twins. In 1946, the colchicine-produced tetraploid snapdragon became a popular favorite and has been doing well ever since.

Seed is basic and a flower or vegetable is only as good as the seed from which it grows. Seed growers everywhere are constantly striving to improve the quality of their products, to put more food, better food, and lovelier flowers in the homes and gardens of America and the world, and to put them there as rapidly as possible.

A Fence for the Future

Condensed from the Pennsylvania Farmer

Howard Snyder

TWELVE years ago I began fencing my present farm. I wanted fences that would last for life and stay tight year after year. I build them this way:

I select corner posts as large as I can find them—8, 10 and even 12 inches in diameter. I live in the South and I can get such posts in boise d'arc, sometimes called osage orange. This is the hardest wood in America. It will last 50 years untreated as a fence post. I set three of these big posts 3 feet in the ground and 8 feet apart at each end of each quarter mile of fence. All other posts are also of osage orange and are set 18 to 20 inches deep and 8 feet apart.

No barbed-wire fence will stay tight if braces are not right. Brace number 1 is a horizontal brace, 2×6 inches, 6 inches up from ground, that connects all three of the big posts. I put on this brace in this way so that my first big corner post, which takes all the strain of the tight wires, cannot yield at all in the ground, especially when the top wire is stretched and fastened. If the big corner post should yield then the other two big posts would have to yield also.

I put crossed braces of 2×6's between each of the three big posts. This gives me two crosses at each end of fence. All braces are nailed to corner posts with 30d nails. With unyielding corner posts my wires cannot slacken.

I now unroll my first spool of wire, a full quarter of a mile length, of standard weight and well galvanized. I fasten it securely to the first corner post where I want the second wire. I fasten it with staples and by wrapping the end around the post and onto the wire itself. I fasten it thus at the end opposite the end from which I will stretch the wire.

I now go to the end where I'll do the stretching and set a temporary post in line with the big corner posts and 8 or 10 feet in front of the first corner post. I nail a 2×6 plank from the top of this post to the top of the first corner post. This is temporary. To this temporary post I fasten my stretchers and stretch this wire temporarily and tight enough to pull it straight.

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This straight wire serves as a guide in digging all post holes in the fence. A wire fence that is not perfectly straight will not stay tight.

After all posts are set, I put two men on the stretcher, an ordinary hand-pulled stretcher, and they give the wire all they can give it. This is enough pull to suspend the wire from the ground if land is fairly level. That is about tight enough on a quarter mile stretch. If I try to give the wire more I usually snap it.

I now staple this wire as securely as possible where I want the second wire up from the bottom and then wrap end of wire around the post and onto the tight wire. The wire is here for good. Only at the two ends and on the two first corner posts is it thus fastened.

I next staple this wire in place on all other posts, being careful to drive staple only part way in the post. The wire can now contract in cold weather and expand in hot weather.

I next put on 3rd and then 4th wires. The bottom wire goes on last of all. My bottom wire used to be slackened when I would put on the top wire. It stays tight now because of the horizontal brace at bottom of corner posts.

At convenient intervals of several weeks I re-tamp the big corner posts during the first year. After a few years these big posts become so firmly set in the ground that nothing short of a bulldozer could budge them.

Sometimes my wire while in storage in the barn has been damaged by chicken droppings, cow manure, or by spilling salt or commercial fertilizer on it. Damage has been the loss of galvanization and wire rusting in places. When I find a rusted place on a new wire I cut that rusted place out and splice the wire. The wire will last only as long as the galvanization remains on it.

I am aware that not all farmers can secure osage orange posts. I'd like to remind them that even a scrub pine post will last 20 or 25 years if treated with a few cents worth of penta (pentachlorophenol).

I call my fences goodwill fences because my cattle stay in my own pastures and my neighbor's cattle stay out of my pastures, and because I did not beg my neighbors or ask them to help me build the fences and there is next to no repairing to do. Mixing up with neighbors on division fence upkeep is usually bad medicine.

Soil Fertility and Nutritive Value of Foods

Condensed from Agricultural Leaders' Digest

Dr. William A. Albrecht
Chairman, Dept. of Soils, University of Missouri

WE ARE gradually coming to believe that the soil, in terms of the food it grows, is a controlling factor in agricultural creation. The pattern of the soil fertility, according to the climatic forces determining it, has only recently been worked out. That this fertility pattern maps out the nutritional quality of feeds and foods is not yet widely recognized or appreciated. That it should be is not so expectable when we have been measuring our agricultural output in terms of only bulk and weight increase rather than in terms of nutrition, reproduction, and better survival of the species.

By subscribing to the production criteria of more tons and more bushels, we have watched the crops but have forgotten the soils that grow them. Accordingly, we have introduced new crops which pile up carbohydrates and caloric bulk readily instead of those which consume much of their own fuel foods in converting a part of them into proteins through help from the soil fertility. When the dwindling fertility makes protein-producing, mineral-providing crops "hard to grow," we fail to undergird them with soil treatment for their higher nutritional values in growing young animals. The soil fertility as help towards more protein within the body, as protection against microbial and other invasions, has not impressed itself. Instead we have taken to the therapeutic services of protective products generated by animals, and even microbes, in our bloodstream as disease fighters. The life of the soil is not attractive. The death of it is no recognized disaster. Hence, it may seem farfetched to any one but a student of both the soil and nutrition to relate the nutritive quality of feeds and foods to the soil.

The provision of proteins is our major food problem. Carbohydrates are easily grown. Any growing plant is synthesizing carbohydrates mainly from the elements of the weather by sunshine energy. For the output of these energy foods very little soil fer-

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tility is required in terms of either the number of chemical elements or the amounts of each. But, in order for the plant to convert its carbohydrates into proteins by its life processes and not by the sunshine power, calcium, nitrogen, phosphorus, and a long list, including the trace elements, are required. Plants and microbes —even those in the cow's gut— synthesize the amino acids that make up the proteins. Animals cannot fabricate these amino acids. They only collect them from the plants and assemble them into their proteins of milk, meat, eggs, and other body-building foods. Both plants and animals assemble their proteins to provide their reproductive functions since these are the only compounds through which the stream of life can flow.

It is in the protein synthesis and in the reproduction of life, that the control by the soil of the nutritive quality of food is pronounced. Our ignorance of this control is suggested when we classify as proteins anything that gives off nitrogen upon burning in sulfuric acid. By this we include nitrogenous compounds that are not proteins. Yet we recognize about two dozen different amino acids as components of the proteins. We know that life is impossible without providing the complete collection of at least eight of them. When even the trace elements, manganese and boron, applied to the soil at rates of but a few pounds per acre for alfalfa increase the concentration of these essential amino acids in this crop—especially those amino acids deficient in corn—there is evidence that the nutritive quality of this forage is connected with the fertility of the soil.

The assessment of the contributions by the soil through only the ash analyses of the crops, has left us ignorant of the numerous roles played in the plant's synthetic processes by the elements of soil origin. In believing that we need "minerals" according to such analyses of our bodies and our foods for their inorganic contents, we consider the soil as the supply of these and the plants as conveyors of them. We conclude therefrom that limestone fed to the cow in the mineral box is the equivalent in nutritional service to lime used as soil treatment coming through the plant.

Likewise have we been content to accept and use average figures for ash analyses. In the same year and in the same state, for example, the protein of wheat has varied from a low of 10 to a high of 18 percent of the grain. Ash elements may double or treble their concentration in the crop on one soil over that on another. Such variations go unappreciated

if we are content to believe that "plants are good feed and good food if they make a big crop." Crops that are doing little more than to pile up carbohydrates, as was demonstrated with soybeans, make big yields of bulk. But when fertilized to produce proteins, the hay yields are smaller. To be content with the above simple faith is to be as agronomically gullible as the youngster content with the knowledge of reproduction that credits this process to the delivery services by the stork.

Our reluctance to credit the soil with some relation to the nutritive quality of our feeds and foods is well illustrated by the belief persistent during the last quarter of a century, namely, that the acidity of the soil is injurious and that the benefit from liming lies in its helps in fighting this acidity when, in truth, it lies in its nourishment of the plants with calcium and its activities in their synthesis of proteins and other food essentials. To say that we don't believe there is a relation between the nutritive values of feeds or foods and the fertility of the soil is a confession of ignorance of all that is to be known of this fact and is not a negation of it.

As yet we do not appreciate the pattern of soil fertility in the United States, that in pre-colonial days was allowing only wood crops, or forests, on the soils in the eastern half. It grew protein as meat in the bison on the buffalo grass in mid-continent, and in some scattered areas farther east like particular valleys of Pennsylvania or the present race horse area of Kentucky. It permitted corn in the forested New England when each hill was fertilized with a fish. Corn on the eastern prairies grew well without such stimulation.

We may well ask whether the soil in its fertility pattern is of no import relative to nutritive quality of what it produces (1) when we grow cattle and make beef protein more effectively today in the former bison area; (2) when that area is now growing the high protein wheat; (3) when we fatten cattle farther east on the more weathered soils and combine this speculative venture with pork production that puts emphasis on fat output by carbohydrates and the lessened hazard by marketing these smaller animals nearer their birthday; (4) when soil fertility exhaustion has pushed soft wheat westward; (5) when the protein in corn has dropped, because of soil exploitation, from an average figure of 9.5 to 8.5 percent; and (6) when the pattern of the caries of the teeth of the Navy inductees in 1942 reflects the climatic pattern

of soil fertility. Such items related to the national pattern of soil fertility suggest that many of our agricultural successes (or escapes from disaster) have been good fortunes through chance location with respect to the fertility of the soil when we have too readily, perhaps, credited them to our embryo agricultural science.

When a crop begins to fail we search far and accept others if they make bulk where the predecessor didn't. We credit the newcomer with being "a hay crop but not a seed crop." If it cannot guarantee its own reproduction via seed, we call it feed for the cow. With the cow's failure to reproduce under such poor nutritional support we, apparently, economize on the bull's energy by resorting to repeated artificial inseminations. The grazing animals have been selecting areas according to better soils. They have been going through fences to the virgin right-of-way. They have been grazing the very edges of the highway shoulders next to the concrete to their own destruction on the Coastal Plains soils. All these are animal demonstrations that the nutritive quality of feeds is related to the soil that grows it. But to date, the animals rather than their masters, have appreciated this fact most.

Shall we keep our eyes closed to the soil's creative power via proteins, organo-inorganic compounds, and all the complexes of constructive and catalytic services in nutrition? When the health and functions of our plants, our animals and ourselves indicate the need, isn't it a call for agricultural research to gear production into delivery of nutritional values related to the fertility of the soil rather than only those premised on bulk and the ability to fill? By directing attention to the soil for its help in making better food, we may possibly realize the wisdom in the adage of long standing that tells us that "to be well fed is to be healthy" and that good nutrition must be built from the ground up.

Conditions Affecting Crops

Condensed from Better Fruit

Dr. R. E. Stephenson
Soil Scientist, Oregon State College

Crop yield is determined primarily by the climatic conditions while the crop is growing, by the nature and vigor of the plant, and by its breeding and adaptability to its environment, by the physical, chemical, and biological properties of the soil, and by a number of things including disease and insect control which may be grouped under management.

Natural subdivisions of climate are precipitation, humidity, and temperature. The season at which the principal precipitation occurs as well as the amount of precipitation is important.

An actively growing plant is so sensitive to moisture deficiency in hot weather that growth may slow to a reduced rate even when only half to three-fourths of the usuable water in the root zone of heavy soils has been taken up.

The root system is absorbing water fast enough to keep the plants alive but not fast enough to keep them growing rapidly. When the plant cells are no longer distended with water, the leaves begin to roll or wilt and growth by the stretching of the cells ceases. It is important to prevent severe water deficits during the growing season.

An appreciable moisture shortage also causes the stomata of the leaves to close for a longer time, thus reducing the supply of carbon dioxide without which the leaves are unable to manufacture food for growth. Then new cells are unable to form rapidly because there is a shortage of food materials for their formation.

Finally, with increased moisture shortage no new cells form and there is no growth until the moisture supply is renewed. Adequate moisture is most important during the season of most active growth and at the time of fruiting.

Adequate moisture supply in the best growing weather is so important to the growth of the plant that a mediocre soil may be made to produce a reasonably good harvest with plentiful moisture at the right time.

For many of the garden and field crops, this means adequate

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moisture in the top two feet of soil where feeding roots are most concentrated and where available nutrients are most abundant. Moisture in the top foot of soil may become a critical factor in hot, dry weather for shallow rooted plants such as strawberries.

Temperatures vary during the season and from one year to another. Planting dates are selected in part to obtain the most favorable temperatures for the particular crop during its growth period. A plant outside of its best temperature zone seldom makes the maximum harvest that is possible where the temperature is more favorable.

Corn thrives in hot weather and maximum yields are obtained only in those states where hot weather is common in the growing season. Western Oregon soils may be just as fertile, but the cool nights of summer do not permit corn yields that compete with the Corn Belt.

Peas require cool weather; and seeding dates as early as possible are practiced. Peas seeded in May would probably produce little, but beans cannot be safely seeded until the warm May weather arrives.

Sudan grass thrives best in midsummer, whereas the cabbage for seed may blast its seed if hot weather comes at a critical period. Empty seed pods then produce a disappointing harvest.

For most summer crops warm weather is growing weather. Growth is the result in part of a system of chemical reactions. The rate of chemical reactions increases with a rising temperature, doubling or trebling in rate for each 18 degrees F. rise.

Growth rate, therefore, increases until the optimum temperature is reached and then a higher temperature reduces the rate of growth. This is a fundamental reason for different planting dates for different crops.

A bad combination is a warm atmosphere with a cold soil. Growers who want to avoid trouble wait until the soil as well as the atmosphere is warm for planting sensitive summer crops.

Humidity of the atmosphere as well as the temperature is an important growth factor. Dry air and a high temperature accelerate the use of water by the plant and aggravate drouth troubles. Moist air that is warm is favorable to good growth, but it is also favorable to fungous diseases, and these are unfavorable to good yields and necessitate a spray program for disease control.

The tropical rain forest is an example of luxuriant growth in spite of low soil fertility but in the presence of an abundance of moisture and a warm climate. A warm, rainy season with well-drained soil may bring an un-

usually good harvest if the weeds can be controlled.

The understanding grower observes the effect of high temperature and low humidity in regulating the frequency of irrigation. Irrigations once a week may not be too often for best results in hot dry weather for some crops, whereas once a month or less may be adequate in cool weather. The grower needs a keen weather eye to observe the response of his crops to weather conditions.

The kind of plant, the variety, its breeding and vigor are important yield factors. When several varieties of grain are compared in a given area, the margin between the yield of the best and the poorest variety is likely to be large, sometimes 50 or even 100 per cent difference.

Use of hybrid seed corn has added 20 to 25 per cent to the average corn yield. The possibility of increasing yields with improved varieties and plant breeding is one of the big opportunities that the future holds.

Varieties are adapted to some soil types and not to others, to certain climatic conditions better than others. The root stock used in grafting fruit trees may be an important yield factor.

Special provision is sometimes necessary to get good pollination for fruit and nut production. A most promising means of crop improvement is through breeding for disease resistance.

Some excellent varieties of fruit may be forced out of production because of susceptibility to some disease. The plant breeder endeavors to replace these disease-susceptible varieties with equally good new varieties that are not susceptible to the particular disease.

Quality of the soil is always an important yield factor. The productive life of an orchard is quite dependent upon the character of the soil profile. Tree roots will utilize 10 or 15 feet of soil depth if the soil is good enough.

With only three or four feet of depth, fruit production with deep-rooted trees will not be high nor will the trees continue to produce for long. The tree top cannot outgrow the root system nor long endure without adequate roots to support it.

Tight subsoils are sometimes as much of a handicap as bed rock. A large amount of clay in the subsoil is nearly always an unfavorable factor. A high water table if it persists in growing weather limits root development as much as bed rock.

A favorable soil profile is one in which the subsoil is somewhat lighter in texture than the surface soil and where drainage is good throughout the entire root zone or to a depth of 10 or 15 feet.

A porous sponge structure that

allows ready water penetration, quick drainage, and good aeration is desirable. Good aeration is necessary for profuse root development and efficient functioning of the feeding roots.

Oxidized colors such as a rich brown are an indication of good aeration. Gray colors and mottling are associated with poor aeration and lack of oxidation. Oxidizing conditions are favorable to high availability of nutrients.

Reducing conditions due to lack of aeration are associated with low availability of nutrients and sometimes with the presence of toxins in the soil.

High humus content well distributed through the soil profile is favorable to deep rooting and good nutrition of the crop. Most of the humus in the soil came from roots of plants that have penetrated deeply in the past. Therefore, the soil structure must be favorable to deep rooting and efficient functioning of deep roots.

Few things contribute more to the fertility of the soil than a good supply of active humus that is regularly renewed. Soils maintain their productivity somewhat in proportion as humus is maintained.

Humus in the soil is the seat of biological activity that is favorable to good plant growth. In the process of breaking down humus and other organic materials, nitrogen is liberated in the form of ammonia and nitrates for the use of growing crops.

These processes, known as ammonification and nitrification, are brought about by soil organisms, bacteria, and fungi. Soils with the highest nitrifying power are likely to be most productive.

Decomposing organic matter is also the source of some of all nutrients and of solvents that attack the more inert soil minerals bringing plant nutrients into solution in a form suitable for absorption by the roots of crops. Thus humus or rotting organic matter liberates its own nutrients and some of those held in the mass of rather inert minerals in the soil.

A soil near neutral in reaction is likely to produce better harvests and is more consistently a good producer. An extremely alkali soil is entirely non-productive, and a strongly acid soil usually has low availability of nutrients and sometimes unfavorable physical properties that are responsible for low yields.

Soils become strongly acid as the result of long continued leaching which removes both the lime (calcium) and other soluble nutrients. The high acidity is unfavorable to desirable biological processes that make nutrients available.

Good management requires that soils be kept reasonably near neutrality. Liming where soils

are strongly acid is a necessary practice for good production.

Soils that are neither too sandy nor too high in clay, the medium textures, are most favorable to high production. Loams, silt loams, and fine sandy loams rate highest in textural suitability for average use.

Some plants are better adapted than others to either the light sandy soils or to the heavy clay soils, and crops can be chosen somewhat according to their adaptation to the texture of the soil. There are not enough of the best soils to meet all the needs for crop production and mediocre soils must be used with whatever improvement appears feasible for the production of a considerable acreage of needed crops.

The important thing is to avoid using soils for some crop for which they are entirely unsuited because of unfavorable physical and chemical properties. Therefore, it is important to know both the soil properties and the plant needs.

Younger soils of the river bottoms are nearly always more productive than the older, more compact, and leached hill formations. But there are flood control problems and sometimes frost hazards in the river bottom soils.

Good management consists of the ability to detect and supply at the right time whatever is necessary to get good production of the crop and maintain the soil. Starting with healthy plants and using whatever precautions may be necessary to keep them free from disease and insect attacks is a part of good management.

Planting dates, spacing distances, tillage practices, variety selections, the fertilizer program, irrigation, and other things may need consideration. A knowledge of the physiology of plant growth, the functions of the various nutrients in plant growth, the relation of the root system and its functioning to the soil properties, and to the plant as a whole—all these may contribute to good management.

Nothing else, however, can take the place of practical experience of a keen observer who learns to sense plant needs somewhat as the animal feeder learns to sense the needs of his animals.

Good soil management is never an easy problem. Although much information about all phases of soil fertility is available, effective application to a specific soil requires keen insight. Though the nutrient elements that plants must get from the soil are well known, spotting a specific nutrient deficiency in any particular soil for a particular crop may require much time and effort by the most skilled research workers.

Several practices can be definitely accepted as good or absolutely essential to fertility main-

tenance. Likewise some are definitely bad and can be avoided. Accelerated soil erosion must be prevented and humus renewal whether by cover cropping, use of soil building sod crops, or other means is necessary to preserve or improve the productive capacity of the soil.

There is no longer any doubt that fertilizers and liming materials have a place in the fertility program, the kind and amount to use requiring special attention for each crop and soil. Improved methods are available for detecting what particular fertilizer or treatment may be needed for a specific crop and soil, but knowledge and skill are required to make use of these methods.

Some years ago in Illinois a farmer (Frank Mann) passed away, and it was said of him that he had farmed the same land for 59 years and left it twice as productive as when he began farming. The essentials of his system were crop rotation, in which lime was used to grow legumes for humus and nitrogen renewal.

Phosphate was used in liberal quantities to build up the naturally low phosphate level of his soil. Of course he returned crop residues and farmyard manure to his land to the extent that it was available. Though he was recognized as an outstanding farmer of his day, his methods were such as anyone might reasonably adopt as sound practice.

There are examples like this in sufficient number to indicate that land can be farmed without exhausting the fertility although there are many different types of farming and the same system cannot be used for all crops and conditions.

Fruit farming should be relatively easy on the soil in that sale of fruit takes away from the soil comparatively little fertility. Excessive cultivation is sometimes practiced and soil erosion that sometimes occurs is more destructive to the soil than the sale of fruit that removes fertility. But methods are now known for reducing the cultivation and for preventing most of the erosion.

Soil is a physical, chemical, and biological system so adapted through natural processes that plants may obtain through their root systems three requirements for good growth, nutrients, water, and air (oxygen).

Proper use of manures and fertilizers will renew the nutrients; some supplemental irrigation in drouth periods will supply sufficient moisture; cover cropping, and other means of humus renewal will help to improve fertility, support necessary soil organisms, and provide a favorable structure for good aeration.

Artificial drainage when needed

will at least partially eliminate excess water and provide a better chance for roots to develop and function.

Lest this sounds too simple, it may be recalled that average crop yields are low and that the margin between average yields and the best yields on good soil is wide, indicating perhaps that good management is far from a universal practice. The encouraging thing is that practical ways and means are known for increasing production without exhausting or destroying the soil.

"Elastration"

Condensed from the Farm Journal

Morrison H. Stewart

You can now dock lambs and castrate either lambs or calves more easily and more safely —by "elastration," a bloodless, almost painless method.

The whole chore of castrating and docking is reduced to a one-man job for any kind of weather.

The name comes from the heavy elastic ring used to shut off the blood supply to the tail or the scrotum. (You should buy new rings each year, and keep them in a closed jar.)

Elastration started in New Zealand in 1942, spread to Australia. This year sheepmen in those two countries treated more than 15 million lambs.

West Coast sheepmen learned about it through Dr. J. F. Wilson, wool specialist with the University of California College of Agriculture at Davis. Western sheepmen like it so well that they docked and castrated more than 2 million lambs by elastration last spring—just two years after the equipment first became available.

When you castrate with the Elastrator, you put the ring over the lamb's scrotum, between the testicles and the body. The Elastrator prongs should be toward the animal. Press testicles down from the body; put ring just *below* the two small teats. In about three weeks the scrotum dries up and falls off.

The lambs show some discomfort at first. This lasts from a few minutes up to three-quarters of an hour. But as soon as the circulation is cut off, pain stops; they

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may be frolicking within an hour. This is in contrast to the usual extreme (and prolonged) pain and shock from the "pocket-knife" method.

Elastration may turn out to be even better for calves than for lambs, Dr. Wilson says. The calves don't seem to notice the ring at all.

It's best to castrate lambs or calves when they are a few days old. Some cattlemen say they have used the rings on calves up to three months old. However, the scrotum doesn't fall off nearly so soon.

Livestock men and college specialists alike, praise the elastration system. A USDA scientist says it is "absolutely satisfactory." Here's what some of the flock owners, dairymen, and cattle raisers who have used it say: "I'll never use a knife again"; "most humane method ever developed"; "no loss from blood, clean and fast"; "now I do the whole job myself without any help."

One user says he used it on a vicious male dog, that now leads a sedate life sleeping in the sun.

Dr. Wilson has a word of warning: elastration is not the final answer to the fly problem. When the tail or scrotum falls off, there is only a very small opening left. This heals over in a day or two; is usually so well hidden by wool or hair that infection or fly infestation is not troublesome—in contrast to the open wounds of the knife method.

Where flies are a problem on late season lambs, put on the ring and cut the tail off just below it two days to a week later. Use a good fly repellent and a disinfectant. There is no pain at all, no blood lost, the wound heals quickly, and there is no danger of fly strike.

The Elastrators are distributed by the California Wool Growers Association, San Francisco. However, you can get one from farm supply houses all across the country. The Elastrator costs approximately $12.50 to $13; rings come at about 50 for $1.80, or 1,000 for $12. (Some farmers are sharing the instrument.)

For the first time, there will be enough of the elastrators and rings to meet the demand next spring.

A Living Rose Fence

Condensed from Better Crops with Plant Food

T. J. Talbert
College of Agriculture, University of Missouri

A LIVING multiflora rose fence for practically all purposes and at low cost is now available. Such a fence is rugged, of long life, has few faults, and is surprisingly well adapted to nearly all sections of the country. In good soil and under proper culture it also can be produced in 2 or 3 years. It is economical, an effective barrier for livestock, an aid to soil conservation, and it is now being used successfully by farmers. In general, the plant is considered new to most sections of the country. It is the hardy understock, however, upon which many of the garden roses are grafted or budded. The name "Multiflora" means many-flowered. Originally the plant came from Asia.

This Asiatic rose is effective against soil erosion, soil blowing, and snow drifting. It also has a place as a screen across gullies, irregular soil surfaces, and for fencing terrace outlets. The washing away and erosion of ditch and pond banks may be prevented through its proper use. The fibrous root system of the plant tends to make it valuable for use as a contour fence. Close spacing of the plants in setting generally increases their effectiveness for such purposes.

The fence is comparatively easy to establish. Yet it is not difficult to eradicate. The plants do not spread from the planting site by roots, seeds, or suckers arising from underground rootstocks. Root growth is generally downward and there is no material extension laterally. The rose does not offer competition to nearby crops and its shade has not proved damaging to cultivated crops. It grows to a height of about 8 feet and to a spread of 7 or 8 feet in about three years. In later years these dimensions in growth do not appear to change materially. New canes grow up and the old ones die. The mass of canes with thorns, therefore, tends to increase in density and become more impenetrable each year without noticeable growth extension.

As a cover for quail and other forms of wildlife it is of great value. This is especially true in prairie regions, bottom lands, and where there are few or no per-

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manent winter harbors. It may also serve to advantage as an enclosure for wildlife areas. The rose is colorful in flowers, foliage, and fruit, and its shape and form render it valuable for use in beautifying both the home grounds and the farmstead. The bountiful seed crop of a reddish brown in color supplies a dependable source of food for many different kinds of birds during the winter season.

The land for the planting strip should be approximately 8 to 10 feet wide. It may be prepared by back-furrowing and then bed-furrowing followed by disking. As a barrier against all classes of livestock the plants are set 6 inches apart. For horses and cattle alone 12-inch spacing will prove adequate. A few commercial nurserymen are handling plants for sale. The rose is so new for farm purposes, however, that the demands may be greater than available supplies. In Missouri, the Conservation Commission at Jefferson City is endeavoring to supply the needs of producers. The rose may be propagated from both seeds and cuttings. Early spring or late fall plantings have given the best results. The plants are placed in a furrow made on the slight ridge in the center of the cultivated planting strip.

In the first experimental investigations the plants were 3 or 4 feet apart for a single-row barrier. More recently plantings have been made with plants one foot apart to turn horses and cattle, and 6 inches apart as a barrier against hogs, sheep, and goats. This closer spacing seems much more certain of achieving results in terms of a tight barrier at the earliest possible date. The multiflora rose cannot be expected to make a dense, vigorous growth where overtopped by trees; hence barrier plantings around woodlots or trees should be at least 20 feet from large trees for satisfactory growth.

The multiflora rose responds markedly to liberal mulching (straw, spoiled hay, old stack butts, etc.). Cultivation the first year or two is likewise beneficial, but cultivation is not necessary where liberal mulching suppresses grass and weed competition. Mulching has generally proven more stimulating than cultivation, especially where there is danger of soil erosion on sloping land. If a single row of roses is used as a field divider, adjacent farm operations, consisting of tillage or mowing, are helpful in reducing weed and grass competition. If supplemented with mulching the need for cultivation is eliminated.

The use of fertilizers seems much less important than good soil preparation, timeliness and thoroughness in planting, proper mulching, adequate irrigation the first year, and good cultivation.

This is true because the response to fertilizers has been varied and sometimes negative.

A fall application of 2 to 4 inches of manure spread over the planting site should generally prove satisfactory. Also the manure may be supplemented to advantage through the use of a complete fertilizer. This fertilizer may be placed on the manure or mixed with it at the time of spreading at the rate of about 160 to 200 pounds for each one-fourth mile.

Thorough disking should follow the fertilizer application. Then the planting site should be plowed as deeply as soil conditions permit and a slight ridge left in the center of the cultivated belt to facilitate soil drainage.

On the experimental grounds, College of Agriculture at Columbia, Mo., under conditions of fairly good soil and culture, a good barrier against horses, cattle, sheep, and hogs was developed in two years. On tight, poor, or droughty soils a longer period may be required to produce satisfactory fences, especially for hogs, sheep, and goats. Under good growing conditions, however, with the plants spaced 6 inches apart, effective fences against all livestock should be produced in 2 to 3 years.

Unlike the Osage Orange, the multiflora rose is a shrub and not a tree; hence it will occupy much less ground. It has the signal advantage of requiring no trimming to keep it in bounds. Its initial vigor, particularly on the poorer soils, will greatly surpass that of Osage. For barrier effect, especially in separating cultivated fields from pastures or in fencing out terrace outlets and the like, the plants should be given good culture. This may consist chiefly of cultivation or mulching, and fertilization may be necessary to provide a uniformly vigorous and dense barrier.

Soil Doctrines

Condensed from The Nation's Agriculture

Dr. Charles E. Kellogg
Chief of the USDA Division of Soil Survey

WE HAVE seen a deluge of articles and books on catastrophic soil depletion in the past 22 years. Yet during the last 8 of these American agriculture broke production records. Some fear that this recent production record is abnormal—that soil depletion is becoming so bad that disaster lies ahead.

Likely some farms are poorer than they were before the war. Many farmers have been growing cotton, corn, and other intertilled crops on erosive sloping soils, holding up yields perhaps with mixed fertilizers rich in nitrogen, but allowing the content of organic matter in their soils to decrease and the surface soil to wash down the slopes. Yet other farmers have been improving their rotations, growing more deeply-rooted legumes, using more lime and mineral fertilizer, and generally improving their soil.

Our soil problems were neglected while good new land was easily had. Science moves slowly. First comes the painstaking fundamental research to establish principles, then the applied research, then finally recommendations and demonstrations. Yet certainly soil scientists can take a part of the credit for the increased farm efficiency of the past few years. And their work was hardly more than started 50 years ago.

In the meantime, special doctrines about soils have arisen. Since there are several of these, at least some of them must be partly wrong. Each has some basis of fact, and many of their advocates are well-intentioned and sincere. But correct appraisal is made difficult by the extremists. Any good idea can become bad or even vicious when carried to absolutism.

About 100 years ago the great German chemist Justus von Liebig stated the balance-sheet theory—the soil-is-like-a-bank idea. Plants require certain nutrients from the soil: calcium, phosphorus, potassium, magnesium, nitrogen, and the like. By chemical analysis of the soil we may find what it contains. Then by analyzing plants we may see what they require.

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Thus a balance sheet may be drawn. We can calculate how many crops can be grown on the soil before it is exhausted, or we may calculate the fertilizers to apply to maintain it.

This seemed so reasonable that people accepted it for a long time, that is, until scientists began to study the soil itself. They found the soils were not simply "storage bins" of plant nutrients in ground-up rock mixed with organic matter. They are far more complex than that.

Soils are made up of a series of layers, one over the other, to a considerable depth—down to the limit of plant roots and other organisms. Normally, in the United States, soils are about 2 to 5 feet deep.

As the surface layer of a sloping soil is gradually eroded away, the upper part of the layer beneath is gradually changed and incorporated into the surface layer. In turn, the upper part of the third layer is changed and becomes the lower part of the second, until finally fresh minerals from the rock underneath are incorporated into the lowest layer of the true soil.

Other soils have minerals added to the top instead of to the bottom. Silty coverings are left by the overflow of rivers. Dust and volcanic ash fall on other soils. Rain brings soluble materials from the air, and percolating water leaches out material.

And so it goes. Soils are constantly undergoing change. Thus thousands of different kinds of soil exist. Each has it own set of characteristics, its own combinations of environmental factors, and its own potentialities for response to management practices. Some soils can furnish enough calcium, potassium, phosphorus, iron, or other mineral nutrients for crops indefinitely. Others respond enormously to one, or perhaps several, of these nutrients, even when first plowed. Nutrients become available to plants in some soils as fast as they are withdrawn; others are soon exhausted.

This touches lightly on just a few of the soil processes. There are many more. What plants require for growth and what soils contain are important. But those values cannot help us much unless we know a great deal more about the soil.

This balance-sheet theory does a lot of harm. It has delayed the recognition by farmers that different soil types should have different fertilizers.

Even now, farmers generally are using mixed fertilizers containing nitrogen, phosphorus, potassium, and perhaps other elements, as a sort of "shot gun" treatment on soils where only one or two of these nutrients are needed; the others are then essentially wasted. Efficiency in the use of fertilizers requires that we use those nutrients that are needed to supple-

ment the ones in the natural soil in order to make it productive. There is no such thing as a generally "balanced" fertilizer. As soon as a chemical mixture is added to a soil, reactions take place. The final "balance" of nutrients in the soil is quite unlike that of the added mixture. Farmers must learn what to add to end up with a balanced nutrient supply in their soils. Then too, the amount of legumes grown and the manure used has a great deal to do with which fertilizers to add.

A large portion of the soils of the United States need to be devoted to grass or grass-like plants occasionally, if they are to remain productive. Most important are the deeply rooted legumes, because they furnish good hay and pasture, their roots help develop a granular structure, they protect the soil from washing, and the bacteria on the roots fix nitrogen. Thus generally the greatest need is for lime and minerals, even on soils low in nitrogen, because by supplying the lime and minerals we can grow the legumes. Yet there are soils where additional nitrogen fertilizer can be used safely to great advantage.

Excessive erosion is a serious problem in parts of the United States and elsewhere. Unless farmers are careful, bad soil blowing will accompany the next drouth in the Great Plains.

One cannot, or should not, try to stop erosion, but rather to control it. Its effects depend upon the soil type. An otherwise productive soil with a claypan or hardpan at 18 inches may be severely damaged by the removal of 6 or 12 inches of surface soil; yet one that is deep and friable may not be hurt at all provided the erosion is controlled short of gullying. The most serious erosion injuries to soil are not the losses of plant nutrients, but the losses of granular surface layers and the exposure of massive clays, hardpans, or even solid rock.

Concentration on mechanical needs to stop erosion itself may be fruitless, or even injurious, if some fundamental factor responsible for poor plant growth like soil acidity or phosphate deficiency, is neglected. And back of these causes may be other reasons.

Generally, when a farm population becomes poverty stricken, it fails to maintain its soil. Disease, wars, and very low prices are important causes. Things get on a hand-to-mouth basis. It is hard to look ahead of this year's income. Where farmers take a long view of production over a period of 10 or 20 years, there are few instances of conflict between those practices that give most return and those that maintain the soil, or even improve it. In fact, a large part of the arable soils in the

world have been made much better by good farming than they ever were naturally.

Some conservationists simply stress the importance of protective cover. We all know this to be desirable and necessary on erosive soils, *but*, and this is a *big but*, farmers have a living to make. The protective cover must be a *productive* cover. And, if our farmers are to have good standards of living, we must go further —we must have a protective cover that is more productive than what we have now. Immediately, this gets us into the question of specific fertilization, crop varieties, better livestock management, and all the other tools of scientific agriculture. It means that these practices must be fitted into a management system that is economically sound as well. That is, two management systems for the same farm might both control erosion and one give the farmer a net income of $500 a year, and the other a net income of $2000. We must have our eye on production as well as on conservation.

Fortunately, the trend in the United States now seems to be toward a more balanced soil management program.

While many early fertilizer practitioners simplified soils in terms of analytical chemistry, the biological side of soils was neglected. Partly as a reaction, different doctrines have recently arisen that place all emphasis on organic matter. Some insist that our chemical fertilizers are downright poisonous; that the liberal use of compost gives special qualities to plants and that they will be free of insects and diseases; and that animals or even people, will be healthier by eating plants grown the "organic way."

Plants need all the elements for growth that scientists say they do, some of the organic advocates admit, but go on to insist that plants also need a mysterious life-giving substance of some sort produced only by living matter. Much of what is written along this line is pure speculation. Yet the maintenance of organic matter in the surface and deep in the soil needs greater emphasis.

The value of chemical fertilizers has been abundantly demonstrated throughout the world. The nitrogen in chemical fertilizer is no different from the nitrogen in compost. But the organic schools do have an important point, often missed because of their extreme statements. If chemical nitrogen is used as a *substitute* for maintaining a reasonable level of organic matter and for growing legumes, the structure of the soil may deteriorate badly, and the erosion hazard may be increased. Further, it is entirely possible to use too much nitrogen fertilizer and have an excess in relation to the other plant nutrients. If that is done, we

may have tall, weak, poorly fruiting plants. Yet, if on a well-managed productive soil, one may raise the yield of corn from 30 to 40 bushels per acre to 70 or 80 with a commercial nitrogen fertilizer, it would be most unwise not to do it.

A few years ago the farmers of the United States were presented suddenly with a new theory: Stop plowing altogether! It was supported by all sorts of statements. Had not the popular books on erosion shown that the moldboard plow was the evil instrument that destroyed the grassland just before the great dust storms? Was it not the moldboard plow that tore up the slopes now suffering from sheet wash and gullying?

The kind of tillage necessary depends on the crops to be grown, and especially on the kinds of soil. Most soils in humid forested regions are not naturally productive for crop plants. Arable soils are made from them by the farmer. Soil fertility must be increased. The soil must be made granular to a considerable depth. This means that organic matter, lime, and fertilizers must be added to the deep layers as well as to the surface ones. Thus on these soils the moldboard plow is most useful to get materials in deeply, to prepare a seed bed, to make the soil receptive to running water, and to control weeds.

There are other theories. Great claims are made for earthworms. Some advocate "balanced minerals" including a large number of those found in plants with unknown functions, if indeed they have any function at all. Claims are made for improved health through the use of minor elements. The extremists of the "organic farming" schools also claim more healthful food. It has been said definitely that erosion lowers the nutritional quality of food. Extravagant health claims have been made for ordinary lime and fertilizer. Any one of these *may, under certain conditions, be true* but none is true under most conditions, so far as science can now determine.

Farmers have enormous opportunities to improve their soils and their efficiency of production. But there is no impending disaster—nor easy panacea. For both soil scientists and farmers there is a lot of hard work ahead— mostly quiet work.

Woodland Co-op

Condensed from American Forests

Walter Rudolph

LATE last August a group of farmers, all small woodland owners and members of Woodland Products, Inc., met in a modern sawmill near Downingtown, Pennsylvania. One of the heart-warming moments of the meeting came when the treasurer, John F. Romig, reported:

"We've done pretty well in our second year of cooperative enterprise—and prospects for 1949 look even better. As against a deficit of $1,468 last year, June to June, we show a net income for 1948 of $10,724. In addition, we now have fixed assets of land, buildings, machinery and equipment and miscellaneous items valued at $37,689."

It was a happy occasion for everyone present. And particularly for Clayton M. Hoff, executive vice-president of the Brandywine Valley Association, with headquarters at West Chester, for interwoven in the background of the Woodland Products, Inc. "success story" is the energetic approach of this association to local land management and good forest practices.

The Brandywine Valley Association represents a group of citizens working for the betterment of communities in the Brandywine Creek drainage area, around 330 square miles with a population of approximately 180,000. Naturally, the health, welfare and prosperity of these people depend to a large extent on the natural resources of this valley, which extends west of Philadelphia down to Wilmington, Delaware.

The association provides a common meeting ground upon which ideas and information can be exchanged and progress measured. More specifically, it encourages and aids the people of the Brandywine Valley to reduce soil erosion, to lessen flood and drought damage, to decrease stream pollution, to improve and protect existing woodland, and to reforest marginal lands and preserve wildlife and natural beauty.

And to all its efforts it tags this emphatic statement—it is not concerned with political or special interests. Its support comes from voluntary contributions and membership dues. All preferences,

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opinions and ideas of members are carefully analyzed and directed toward the greatest benefit of all —farmers, town residents, industrialists and sportsmen.

Back in 1945, the cooperative was little more than an idea in the minds of interested farmers around West Chester and J. Howard Mendenhall, just out of the Army and looking around for a job. A forestry graduate of Pennsylvania State College, Mendenhall had read of the Otsego Forest Products Cooperative, in Cooperstown, New York, and the fundamental idea appealed to him.

He discussed it with officials of the Pennsylvania Forestry Association, particularly with its president, H. Gleason Mattoon, and recounted the experiences of farmers around his native West Chester.

Mattoon recommended that Mendenhall talk over the cooperative idea with Noah Hershey, president of the Coatesville Egg Auction, a cooperative that in its own field had grown to a $250,000 enterprise in eleven years. In November of 1945, these men got together with another interested citizen, Paul Coates, a progressive farmer and grange member.

At this meeting Mendenhall was advised to do more research on the cooperative idea in connection with woodlot "harvesting." But by now the Brandywine Valley Association had warmed to the idea and asked him to become a staff member of the growing, influential organization.

"Join up with the association," Hoff said in effect, "and continue with your work to get this cooperative going—you'll be on our payroll and everyone concerned in the valley will benefit."

Mendenhall joined and worked harder than ever on the cooperative idea. He drew up three recommendations from which the knot of cooperative-minded men might choose:

1. Logs and cordwood might be pooled by farmers and marketed through a central agency on a commission basis to sawmills, furniture plants and other concerns, or sold as firewood and pulpwood. No ownership of equipment was involved.

2. Farmers could own and operate an ultra-portable sawmill that could be moved around and set down on small woodlots to speed logging.

3. Farmers could own a permanently located sawmill and operate it for their sole benefit, doing custom sawing (badly needed by the farmers), and owner-members could work for woodlot conservation and the most profitable utilization of their trees.

Of the three suggestions, the last seemed most promising and Mendenhall was asked to draw up a prospectus setting forth information on equipment needed,

costs and general operational possibilities.

The meeting progressed to the point where a temporary organization was set up and the name, Chester-Delaware Woodland Owners Co-op Association, was given the group.

Early in 1946 a handful of charter members of the hopeful cooperative dug deep into their pockets to finance their first acquisitions, including a two-man, gasoline-powdered chain saw. Research had revealed that about $50,000 would have to be raised to put the enterprise on a sound footing—but members were eager to be about the actual cutting of woodlands.

Several cuttings were made, working with a green crew, and in March still more organization was undertaken. An executive committee was approved and directors and officers elected. Finally, an application was made to the state for a charter.

Then the jolt came. Pennsylvania, under existing laws, couldn't grant a charter to a cooperative interested in woodland management and marketing. At the same time, further pieces of sawmill equipment needed were proving to be "unavailable." And to top it off, the first cuttings were not earning money.

At this dark moment, a ray of cheer came from the Pennsylvania Farm Bureau, by now quite interested in the cooperative's development. It advised that the group could organize under a corporation title, and still retain cooperative by-laws. Thus a new name, Woodland Products, Inc., came into being and again the organization forged ahead.

The charter granted by the state allowed issuance of 1,250 shares of common and an equal number of preferred stock at $10 a share. The charter, further, stipulated the right to:

". . . manufacture, buy, sell and deal in, either for itself or as an agent for others, timber, lumber, millwork and other building materials of every kind and description, and in the development of woodlands and the resulting by-products of forests; and to engage in the buying and selling of machinery and equipment necessary and incidental to timbering, lumbering and millwork and to perform any and all things necessary and incidental to such business."

Membership swelled in the co-op. Stock investments grew. More equipment was bought and a second-hand sawmill was acquired and temporarily set up on an eight-acre plot of ground purchased near Downingtown. The sawmill was in excellent condition and large enough to handle the largest logs in the vicinity.

The acreage was a wise buy, being located on the main line of the Pennsylvania Railroad, beside a surfaced road and having

access readily to electric lines for power. It also boasted an alfalfa crop, a sideline cash income for the fledgling business.

By late April, 1947, the first logs had been cut, and in the following month 100 thousand board feet of lumber were sawed out in spite of temporary shutdowns and the training of green millworkers. Co-op investments in June amounted to nearly $12,000.

Custom work, as had been foreseen, was the biggest need of co-op members whose farms were construction-hungry. In August of that year the first annual auditing of the co-op's books showed operations to be "in the red," but there had been only two months of actual mill operation.

The co-op had a truck, caterpillar tractor, chain saw, a fifty-six-inch saw with a thirty-foot carriage and fifty-two-inch head blocks, a cut-off saw, slab elevator and edger, all electrically-powered, and sundry other tools incidental to sawmill operation. At the first annual meeting it was voted to erect a permanent sawmill building.

A concrete block structure, 140 feet long, with an aluminum sheeting roof, was put up during the past year. And another truck was acquired as operations gradually moved into the "black" side of the books. Some seventy-five members of the co-op now reap these benefits:

1. Their trees are marked for cutting, and logging is supervised by the co-op's forester, Sam James, who pays special attention to sustaining the individual woodlot's yield, stipulates weeding if necessary and tries to improve the stand.

2. A reliable contractor is engaged to do the cutting, skidding and hauling of logs, at a reasonable rate, if the farmer so desires.

3. Custom sawing, according to a member's specifications, is done at the sawmill. The charge for this—at this writing—is $20 a 1,000 board feet, payable in cash or logs.

4. Trees standing in a co-op woodlot can be paid for in cash equivalent to ninety-five percent of current prices, the remaining five percent payable in common stock or in cash for amounts less than $10; the same arrangement applies to logs delivered at the sawmill; members may purchase additional stock, if desired, with logs in lieu of cash.

5. Co-op products, such as lumber, sawdust and slabwood, are sold to members at reasonable prices, or to private buyers; a continuous search for new markets is maintained.

There is plenty of room for expansion of facilities, and nearing the blueprint stage are plans for a drying kiln, planing mill, fence post and timber treating equipment.

Truly, the continuing success of

Woodland Products, Inc., will prove beneficial to all concerned and a boon to anyone interested in good forestry practices and the conservation of the country's natural resources.

New Cleaning Materials

Condensed from Guernsey Breeders' Journal

Ray Kolar

WITHIN the last few years the cleaning of milk utensils, and milking machines, on the farm has been aided greatly by new materials that have become commercially available through new developments along various lines in the chemical and related industries.

One of the most publicized of these developments has been the increased use of "wetting agents." Wetting agents have been known for many years. They have been important in the dyeing of cloth for a long time. In fact, the German dye industry has been successful because they had the chemical know-how to produce "wetting agents." However, in the early 1940's wetting agents were first added to soapless cleansers to determine if they would help the cleaning operation. They were immensely successful, and from that beginning wide-spread use has resulted.

A wetting or surface active agent is a general term for any material which modifies the properties of the surface layer of one material in contact with another. Water, when spilled on a waxy, greasy or impervious surface, or in the fine dust on a roadside, will form a ball, or drop, which tends to cling together. This property is measurable force, and is spoken of as, "surface tension." Another example of this property is a tent. A tent will shed water because the water particles tend to cling together and do not penetrate the canvas of the tent. Wetting agents would destroy this property and cause a tent to leak. They reduce this "surface tension," and are defined as surface tension depressants. It is easy to understand why this same property would aid in penetrating milk soil particles and wetting them.

From a beginning of only a

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small portion of wetting agent in cleaners (two or three per cent) the quantity of wetting agents has increased percentage wise, in cleaners offered to the public, to the point where some materials are 100 per cent wetting agents. Up until a few years ago, soapless cleansers softened water by precipitation. A common ingredient was tri sodium phosphate, which had the ability to soften water by precipitating the lime from the water. This can be demonstrated by adding a little tri sodium phosphate to hard water. A milky solution results, and after standing a few minutes, a floc resembling snowflakes is seen in the solution, and eventually they settle out. This tends to increase the problem of milkstone.

More recently, some half dozen of the new-complex phosphates, such as sodium hexa meta phosphates, and sodium tri poly phosphates, have been used as water softening agents. They have the ability to soften water without the undesirable precipitation that occurs in tri sodium phosphate cleaners. They also have the ability to suspend and emulsify soil particles. These materials are very common ingredients of the so-called fortified "wetting agent" cleaners, which are the most efficient of cleaners for removal of ordinary soil in hard scrubbing of equipment.

The choice of a proper cleaner will greatly reduce the amount of labor involved in cleaning milk equipment. Especially is this important in the case of milking machines because of the large portion of rubber parts which are porous, and any tendency toward precipitation in the cleaner will cause a great deal of difficulty in cleaning this rubber.

Alkaline cleaners have been used since the beginning of time. However, a study of the type of soil has led to the need of a different type of cleaner in the removal of the calcium constituent of milk from dairy equipment.

Analysis of milk allowed to dry on equipment shows that a sizable portion of the soil consists of minerals, largely calcium. Calcium or lime is made soluble by neutralization of certain acids. This knowledge was applied to mechanical can washing, with the idea of removing or preventing milkstone. Some of the first acids used were of the mineral or inorganic type. Due to their highly corrosive nature toward metals, and the injury to hands, they were not widely accepted. However, later research brought forth the use of organic or vegetable acids which are mild, relatively non-corrosive, and are found widely in nature and in foods. Because they are slower acting, easy on the hands, and softer to use, they have been widely accepted. In many cases they have been combined with

wetting agents to provide emulsification of the organic soil. The use of these materials has been the basis of removal and prevention of the mineral film often called "milkstone."

The alkaline cleaners and acid cleaners cannot be mixed, so a method of use has been developed. It is called the alternate wash method, or alternate cleaning, from the alternating of alkaline and acid cleaners. The purpose is to prevent the build-up of any particular type of soil, preventing a residue which will harbor bacteria and provide them with food.

A discussion of a new development in sanitation would not be complete without mentioning the quaternary ammonium compounds which have become commercially available within the last few years. They may be used in certain phases of milk production with advantages, because they are non-corrosive, odorless, stable in the presence of organic matter, and practically neutral in reaction. For these reasons they have much to recommend them. Materials treated with the quaternaries will remain relatively sterile for a period of 24 to 36 hours after treatment, when exposed to normal atmosphere. This residual, or bacteriostatic effect, will make the quaternary very desirable for washing cows' udders, and similar uses.

However, here is a word of caution concerning them. The quaternaries are incompatible with ordinary cleaning materials. Therefore, if you wash your equipment with a soapless cleaner, then in the sterilizing operation a varnish-like, or iridescent film, often appears. For this reason, the use of quaternaries is not to be recommended for milking machines and milk utensils. However, their use in the barn for washing udders before milking, and dipping the teats after milking, is to be recommended. Their use, and good sanitary practices, will do much to prevent the spread of mastitis infection in your herd.

The Embryonic Period and Chick Mortality

Condensed from Northeastern Poultryman

Dr. Alexis L. Romanoff
Cornell University

To START with good eggs is not always a guarantee of obtaining healthy and viable chicks, for there are many factors that interfere with, or alter, the course of development during the embryonic period from the time the egg is laid until it hatches. In commercial hatching, therefore, there are two important factors to be considered. One is the predetermined genetic constitution of the egg, or its relative ability to transmit desirable characteristics to the chick. The other is the extent to which the embryo is capable of withstanding mistreatment before and during incubation.

It is well recognized among scientists that embryonic tissues have an enormous power of regeneration: that is, of recovering from injuries, whether physical, or caused by nutritional deficiencies or other adverse conditions. This natural capacity is in our favor. However, the power of regeneration is not perfect. For instance, exposure to high or low temperature for a few hours does not kill the hatch, but nevertheless may retard embryonic development and delay the hatch, as we will see later.

Let us review a few of the known factors which, by interfering with embryonic development, are responsible for the production of chicks of inferior quality. For convenience we may subdivide the chick's embryonic life into two phases—the preincubation and incubation periods—and note briefly the influencing factors in each.

It is surprising how much damage can be inflicted on the embryo during the preincubation period (the holding period, from the moment the egg is laid to the time it is set in the incubator) through the operation of seemingly insignificant factors. Among these factors are time, and a number of environmental conditions.

It is a known fact that eggs lose hatching power with age. The time required to destroy the egg's hatching power varies in different species of birds. For example, the eggs of the chicken do not survive as well as turkey eggs, and duck eggs are even more perishable.

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May, 1948, 376 Boylston Street, Boston, Mass.

After three weeks of holding, duck eggs do not hatch at all, but turkey eggs show only a slight reduction in hatchability after five weeks of holding under identical conditions.

The temperature at which hatching eggs are held is of paramount importance. Numerous investigations indicate that 55° F. is the optimum temperature for the holding of hatching chicken eggs. In eggs held above or below this temperature, embryonic mortality is higher than normal. This effect of improper storage temperature is accentuated in eggs held for increasingly long periods of time, especially more than one week. Extremes of temperature may be harmful within a much shorter time. For example, eggs may be kept at 32° F. for 12 hours without reduction of the hatch, but if they are held at this temperature for 72 hours, embryonic mortality is sometimes 100 per cent.

Relative humidity has an enormous influence on the loss of moisture from the egg, but the exact role that humidity plays in the preservation of hatching eggs is still unknown. To be on the safe side, it is recommended that the relative humidity be kept at about 70 per cent.

There is no doubt that low humidity, together with high temperature, would be most destructive to hatching eggs, perhaps within a relatively short time.

A very important factor is the handling of hatching eggs. Rough handling or jarring in transportation may weaken or even rupture the chalazas. The chalazas are important structures that maintain the orientation of the yolk in the fresh egg.

Work done in Russia has shown that eggs with chalazas that have been weakened or broken in transportation are not fit for hatching. Such damaged eggs, if incubated, result in abnormalities in development and increase the number of crippled and generally weak chicks. Penionzhkevich has presented the following figures:

	% Hatch of Fertile Eggs	% Weak or Abnormal Chicks
Control	61.9	4.6
With weakened chalazas	41.7	9.0
With broken chalazas	32.7	17.6

In England it has been shown experimentally that the viability of the germ can be extended by storage in air containing a moderate concentration of carbon dioxide—about 2.5 per cent. In ordinary air there is only 0.02 per cent of carbon dioxide, that is, less than 1/100 as much.

Apparently these experiments have not been repeated. However, it would be of interest to pursue further inquiry into the effect of adding carbon dioxide to the storage atmosphere, and thus to determine whether or not this procedure is practicable and of any economic value to commercial hatching.

It is perhaps worthwhile to mention here that the electrical activity of the living blastoderm in the fresh egg appears to give some indication of the future viability of the embryo. In a large number of experiments, we observed that the greatest electrical activity is found in eggs in which the result of subsequent incubation is the early death of the embryo.

We do not know as yet the true meaning of these observations. These experiments must be repeated on larger numbers of eggs before it can be definitely stated whether or not electrical phenomena may provide a practical criterion for the selection of eggs with vigorous embryos.

Practical hatching is not a problem of mechanics alone. It is a problem of the biological balance between all conditions inside and outside of the incubator. The best of incubators will yield poor results if the conditions in the incubator room are unfavorable. Lack of oxygen, the presence of flour dust from feed rooms, or of poisonous gases, such as ammonia from manure or carbon monoxide from heating stoves, etc., may not only reduce the hatch but greatly lower the vitality of the hatched birds. In France, during the last century, the experiments of Dareste indicated the ill effects of many such environmental factors, as have observations made subsequently in the course of diagnosing unsuccessful hatches.

The hatcheryman is sometimes confronted with the problem of what to expect if the incubator, owing to mechanical defects, reaches too high or too low a temperature. To settle this question, we performed a series of experiments. Many groups of eggs, at various stages of incubation, were exposed either to high (140° F.) or to low temperature (84° F.) for 24 hours. The results were dramatic. In some groups the mortality was slightly increased. In all cases, development was retarded and hatching was delayed even in a group stimulated by high temperature during early development.

Very interesting results have been obtained in our laboratory when oxygen was introduced into the incubator during early incubation. It was found that the best embryonic growth and highest hatchability occurs when the oxygen concentration is elevated to approximately 32 per cent.

Fresh air usually contains less than 21 per cent of oxygen. In

an incubator full of eggs at all three stages of development there is about 18 per cent, or even less.

The fact that an increased amount of oxygen in the incubator —nearly twice the usual percentage—gives better hatching results is very interesting indeed. Further studies may indicate what are the possibilities of using oxygen in commercial incubation.

It is of interest to note that the effects of small doses of X-rays become apparent only after a delay of varying length. Immediately after exposure to X-rays, the inherent defensive forces of the embryo combat the radiation effects and help the organism to recuperate. Moreover, certain doses of X-rays may stimulate the growth of the embryo. In view of this fact, it may be possible that various kinds of physical radiation may be of some practical value not only in maintaining, but also in improving, the natural viability of the embryo.

The distribution of the hatch is frequently a good indication that the incubation environment differs from that required by nature.

Under normal conditions, all chicks hatch within a short period of time, not much more than 24 hours. If the hatch is widely spread over several days, it is for one or more of the following reasons:

1. The eggs differed too greatly in age, that is, they were laid more than one week apart.

2. The eggs differed widely in shell permeability.

3. The humidity in the incubator was either too high or too low.

4. The air movement above the eggs was too great. The effect of this factor is especially noticeable with duck and pheasant eggs.

The body weight of a good chick, properly incubated, constitutes the highest proportion of original egg weight—normally about 70 per cent. A good chick also has the least amount of unabsorbed yolk in proportion to his body weight—about 15 per cent. Both of these ratios are good indices of the efficiency of embryonic metabolism.

Either too low or too high an incubating temperature may increase the ratio of unabsorbed yolk to body weight of the newly hatched bird. Abnormal temperature has this effect on all species studied—chickens, turkeys, ducks, pheasants, and quail. Temperature also influences the ratio of body weight to original egg weight; this ratio is too low or too high, respectively, when the temperature is below or above the optimum. Rapid air movement in the incubator is deleterious to ducks and pheasants, but apparently does not harm the other species.

The growth of the brooded

birds is also greatly influenced by the temperature and humidity of the hatcher. High or low temperature may result in slow growth, especially in turkeys. If the humidity in the incubator is too low, the growth of newly hatched ducks may be retarded; either too low or too high humidity has the same effect on quail.

High mortality in brooded birds may be caused by a number of factors. The eggs may have been held too long before incubation, or too high a humidity in the incubator may be the reason. Chicken eggs are especially sensitive to humidity, turkey eggs to temperature.

It has been found that crippled chicks are usually the result of damage to the eggs in transportation. Rough handling often causes weakening or rupture of the chalazas. Too high or too low a temperature during incubation, or a very low temperature in the hatcher, may also cause crippling of chicks, turkeys, pheasants and quail.

In conclusion, it may be stated that the quality of the chick is determined not only by genetic and nutritional factors, but is also subject to the cumulative influence of many environmental conditions both before the egg is set in the incubator, and during incubation. In other words, the treatment the egg receives at all times is of prime importance. The incubator is an efficient tool in the hands of an experienced hatcheryman, but if incorrectly used, it may give non-uniform and occasionally very disappointing results.

Stubble mulch

The application of ammonium nitrate on stubble-mulched land has put more wheat in the bin for three years at the Wheatland Conservation Experiment Station near Cherokee, Oklahoma. The ammonium nitrate was applied in March of each year, at the beginning of spring growth, at the rate of 12.5 pounds per acre. The increased yield of wheat averaged 5 bushels. Apparently the ammonium nitrate stimulated straw decay, releasing plant nutrients for the new crop.

—Successful Farming

Planning Committees

Condensed from the Extension Service Review

WHAT'S a county planning committee worth to a county or to its extension program? Perhaps different things to different counties; but here are some of the things it means to Sanilac County, Mich.

The planning committee was set up by County Agent Clarence Prentice in a small way about 10 years ago. Today his excellent county extension program in Michigan's highly concentrated dairy, bean, sugar-beet, and general-farming area is aided by more than 20 advisory groups functioning actively.

Prentice has been aided by Frank Suggitt, former assistant, and his present assistant agent, Gerhard Gettel, in the program planning. In 1947 the planning committee framed and adopted a constitution with this objective: "To foster and promote better conditions of farm, home, and community for all people in all areas of the county, and to act as an advisory committee to the county extension office.

Here are some of the results: The steering committee listed, following a survey, eight problems in which the county farmers were mainly concerned. This committee spent more than four full days on the inventory, planning and starting action. These were farm men and women who were willing to give their time to serve in this important job.

Eight committees of seven persons, one for each problem, were named; and they went to work.

The drainage committee, working with the county drain commissioner, has a goal of making "Michigan's worst-drained county its best-drained county." Sanilac County, with rich level land in Michigan's "thumb," has more miles of drains than any county in the State. But they are inadequate. "Proper drainage will increase the income of farms drained by Elk Creek's drainage basin by a million dollars a year," they heard County Agent Prentice say. The drain commissioner nodded his agreement, and the committee went to work on a unified program. A comprehensive survey was completed to determine what had been done and what is needed. Opposition to the program developed by farmers living on higher land, but with so many farmers interested it soon faded with a compromise. Really constructive work is now being

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started to relieve the annual spring problem of too much water for many farmers.

On January 1, 1948, only 4 of the 26 townships in the county had fire protection. The fire protection committee went to work. Within 4 months, 11 counties had signed up for protection, and it looks as though the goal of complete county-wide fire protection by 1949 would be accomplished.

The rural health committee is making an intensive survey of the sanitation and health needs of the county. Their goal is a county health unit and adequate hospital facilities under the Federal act.

The other committees—schools, roads, weed control, crop production, and zoning and building restrictions—have made similar progress during the past few years.

County Agent Prentice gives credit to the unselfish efforts of the committee members, who have worked diligently and faithfully for the accomplishments gained to date. But any extension worker knows that the organization ability and the confidence the farm people have in those planning such an extensive program have much to do with its success.

This intensive planning effort in Sanilac County is a continuation of the original land-use planning program sponsored in Michigan. It was started under the leadership of H. A. Berg who is now assistant director of extension. Berg still is actively interested in promoting this democratic planning procedure. Twenty Michigan counties have preceded Sanilac with intensive planning. Others have made requests for special assistance in furthering the work. The Michigan extension budget for 1948–49 provides for the employment of assistant county agents in land-use planning to establish the program in counties which desire it.

Wheat

When wheat is seeded on contour slopes, rather than up and down hills, increases of 2 to 3 bushels an acre are reported by the University of Illinois. This is in addition to the soil-saving achieved by the contour method. Little additional time or trouble to plow, disc, or seed on the contour was reported by farm record cooperators.

—*Successful Farming*

Steaks Sell Turkeys

Condensed from American Poultry Journal

Frederick L. Young

THE advantages of growing turkeys for steaks and roasts are so many that it will pay every grower and processor to study the possibility of producing them. It takes no more time to grow a 40 lb. bird than a 20 lb. bird. The larger bird will produce a higher percentage of meat per pound of feed than the smaller one, giving you more for your money. Bigger birds are fast growing and healthier birds.

As soon as the housewife realizes that turkey meat in steaks and roasts is as good as beef for Sunday dinner, the market for turkeys will increase. With a year-around market for larger birds, the loss from the low holiday market price will decrease.

If processors could have a steady supply of turkeys the year around, they wouldn't have to pay that cost for labor and storage that comes from handling a large number of birds in a 3-months' period and one over a 9-months' period. This problem could be solved by producing boneless turkey steaks and roasts the year around. The cost of storing and shipping these would be much less than the large bird.

Few grocers have room in their meat-display counters to place a whole turkey beside a beef steak, but the turkey without the bone can be placed there with no difficulty. The housewife looks at a turkey and immediately thinks of Thanksgiving or Christmas but when she looks at those delicious red steaks she will think in terms of week-day meals.

The steaks and roasts will present the turkey in a form that more housewives can use. A nine or 10-lb. turkey is too large for the family of 3, but 3 4-oz. steaks are just what they can use.

One of the best selling points is that the steaks and roasts have the 6 qualifications that all good food products must have. The first is uniformity. They can be made of all light or all dark meat as has been done in Texas. In addition, they can be made of a mixture of light and dark meat to the same proportion as in the turkey, which is 35% light and 65% dark. This is done by first separating the light from the dark meat, weighing out

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the desired amount and then preparing the steak.

The second is economy. Although turkey steaks are now quoted at $2 a pound by one Kansas City firm, when the process of boning has become more efficient and more growers raise large birds, the cost will drop. Even now when beef steaks are selling at near a dollar a pound, one serving of beef takes 50 to 75% more meat than turkey because of the bone and fat. Consequently the price of turkey steaks will not have to come down much to be cheaper than beef. An average serving of turkey meat as steak is 4 to 4½ oz. where as with beef it is from 6 to 7.

The third is nutrition. The food value of turkey meat compares favorably with any other meat.

The fourth is eye appeal. When a turkey steak is placed along side a beef steak, the only difference is the small size of the turkey steak. Whether it is prepared by the Texas-boneless method or the turkey-mignon method, it gives the appearance of one piece of delicious meat. It gives a good appearance to the housewives' observing eye because it is a solid piece of meat, no bone or fat to be cut away.

The fifth is ease of preparation. The steak or roast is ready to cook the minute it comes off the dealer's meat counter. Mr. Leonard Voss, executive secretary of the Missouri Poultry Council, recommends that the steaks be cooked for 4 minutes and then promptly served. They may be rolled in batter first.

The sixth is ease of serving. The steaks stay together nicely after cooking and will present no problem in serving. If, however, they are not served promptly after cooking or are cooked too long, they will become dry.

Here are two processes for making steaks or roasts. The first step by either process is to bone the turkey, which takes from 12 to 45 minutes, depending on the skill of the person. The necessary equipment is a sharp knife. A square trough comes in handy in keeping the bird from slipping when you work, but it isn't absolutely necessary. The turkey is placed on its back in this trough.

Mr. Floyd Reese, chef for the Daniel Boone Hotel, in Columbia, Missouri starts boning his turkeys by cutting off the wings and legs. The skin is then removed from the carcass. The next step is to cut off the breast meat and any other small pieces of meat on the carcass. After the tendons have been removed from the drumsticks, the bones are cut out of the wings and rest of the leg. A tendon puller makes this process much easier, but it is not a necessity. Mr. Reese can bone a 20 lb. turkey in about 25 minutes when he uses a tendon puller.

In the Texas boneless steak

process, the meat is then cut crosswise of the grain into pieces 2 or 3 inches square. These are then fed through a cube steak machine or pounded together with a meat tenderizer. After the first run through the machine, the pieces are placed together and run through again. It requires 3 or 4 runs to get the meat to knead together well. For best results, the meat should be at a low temperature, around 38 or 39 degrees. The steaks are then ready for cooking.

The neck, skin, bones, and the other parts that are left over are used in chicken soups and salads. Or the neck, heart, and gizzard (not the liver) are cooked, and this is ground with the rest of the meat, which has been cut into small pieces crosswise of the grain.

The fat and skin are ground up and mixed with the meat also to reduce the waste and to try to make the meat taste more like the roast turkey. The taste that is distinctive about the roast turkey comes from the oils and fats that are just under the skin and are cut off with the skin in the boning process. It must be appreciated that turkey steaks have a distinctive taste of their own which is not like roast turkey.

The meat is chilled and placed into round molds 4 inches in diameter and compressed by hydraulic presses into long round rolls. The rolls are quickly frozen. When the steaks are to be cut off, the temperature of the rolls is raised to 32 degrees, and the steaks are sliced off by a machine, which cuts them to any desired thickness. The best thickness is about ¼ inch. The heat of the machine melts slightly the moisture in the meat, and when the round steaks are placed together, they stick together. They may if desired be shipped in the original roll form and cut by the distributor.

The roast is primarily the same thing as the steak except that the mold is larger and the roasts are cut one inch thick. The mixture of light and dark meat gives it a mottled effect.

LPG Runs Farm Tractor

Condensed from Western Farm Life

LPG is the oil industry's abbreviation for liquefied petroleum gas. Known to many as butane, propane, bottled gas, canned gas and similar trade names, LPG is becoming an increasingly important tool in the lives of farmers and rural homemakers.

The gas equipped home is a convenient home. By far the most popular uses of the butane and propane gases at present are for cooking and heating. About 17,000,000 American homes are gas equipped, more than 2,000,000 of these using LP-Gas. This means that about one in every eight gas ranges in the United States beyond the reaches of city gas mains is fueled with propane or butane.

Rural homemakers are well aware of the advantages of having an automatic water heater in the basement, which delivers as much or as little hot water as is needed. Valued, too, is the silent refrigerator in the kitchen, because there are no moving parts in the machine, nothing but a tiny gas flame which controls the chemical action of the refrigerant fluid; and the beauty and conveniences of a modern gas range is well known. Already many farm homes have installed gas room heaters, either the hot air radiant type or hot water radiators heated by a gas flame in the radiator itself. Then, too, there is the central heating system fueled with LP-Gas.

This new industrial tool can be utilized for many production operations which add to the farm income—for brooders, warming feeds and mashes, chilling milk with a gas refrigerator in the milk house, and for sterilizing equipment in the milk house by aid of hot water, steam and a mechanical sterilizer. Gas torches and gas forges can shorten work in the machine shop, and a special kind of smudge pots are made for orchard heating to prevent killing frosts.

Latest innovation in the amazing growth of varied uses of LPG is its use as a fuel for tractor and stationary engines. Propane or a mixture of propane-butane as a motor fuel is reported being used in hundreds of tractors at the present time.

The farmer readily sees and realizes the value of gas in the home for cooking, household heat-

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November 1, 1948, Denver, Colorado

ing and heating hot water, but would it be a paying proposition to install a gas pasteurizer, sterilizer or similar equipment in the dairy milk house? What is the advantage of having a gas heater in the stock tank? Why convert the tractor from gasoline to propane? What are the advantages and comparative costs of starting with a large farmstead storage tank with the idea in mind of enlarging present gas uses at a later date? How do the operational costs of propane-butane in the tractor compare with gasoline?

Some of the uses and costs of this comparatively new product are well known—such as cooking, water heating, heating homes and refrigeration. Some not so well known are running irrigation pumps, tractors, trucks and busses, heating chicken brooders, orchard heating, enriching auto gasoline, supplying heat for pasteurization and sterilization in the milk house.

Let's begin with the carburetion of this booming by-product that used to be flared off at refineries and gasoline plants. The nature of the gas is liquid, but it vaporizes when the pressure is released and it comes in contact with air.

Engineers, in analyzing the use of propane in tractor motors, have found that it has an octane rating of about 120, can be compressed more highly without detonation and can be made to produce more efficient power because of its slow burning characteristics. A fair comparison would be a late model high compression engine burning ethyl gasoline as compared with a low compression engine of the same size burning white gasoline. This slow burning produces a smoother flow of power than is possible with the best present day gasoline, according to the Acme Carburetion Engineering Company. It is reported, too, that engine compressions can be raised 10 to 20 per cent to take advantage of this with a resulting increase in power.

Then too, there are no odors and no smoke; and, propane-butane leaves no carbon deposit. This means a substantial reduction in repair bills. Cylinder wear is reduced to a minimum as friction and pressure are the least contributing factors to wear, while corrosion is the highest. Clean engine oil is another major factor being made possible by the fact that the combustible (LPG) is introduced into the firing chamber in a pure gaseous state. It does not dilute or contaminate the lubricating oil. Thus, the trouble-making sludge, gum, carbon, varnish and other elements are eliminated with resultant increase of engine life at maximum performance.

What does it cost? Converting

the average farm tractor from gasoline to LP-Gas varies in cost from $250 to $400. On the average farm it would probably take a year to pay for such an installation. The short-time saving is in fuel cost, but savings in maintenance and engine repair over a period of time more than offset installation costs, according to advocates of LP-Gas.

Tests performed with several farm tractors brought out the following averages: The gasoline powered tractors burned an average of five and one-tenth gallons of gas per hour at a cost of 17 cents per gallon, while the LPG powered tractors of the same make and model size used an average of four and one-seventh gallons per hour of LPG at a cost of 13 cents per gallon. If a farmer has a standard 550 or 1,150-gallon storage tank to accommodate butane-propane uses on the farm, the chances are fuel costs would be even less per gallon.

It is pointed out by the gas equipment division of the Eaton Metal Products Company of Denver that it is difficult to give accurate costs of LPG, when used in a tractor, due to the many factors involved. Proper conversion of the engine from gasoline to propane is definitely the function of a top flight mechanic that understands LPG combustion. The type and kind of tractor will make operating costs vary, so the average figures given above would be fairly accurate.

C. R. Reller of Minneapolis-Moline's automotive division has this to say about LP-Gas as a tractor fuel:

"Power and flexibility with this fuel are good. Power is at least equal to 70 octane fuel and usually 8 per cent higher. Engine bearing life, cylinder wall wear, valve life and so forth, will be comparable to that obtained with gasoline under similar operating conditions. Oil life is usually longer due to less contamination.

"Outside of idling and fuel adjustments, special service is ordinarily nothing more than an occasional drain of the fuel filter. Minneapolis-Moline service bulletin D64 covers these and other subjects in regard to starting.

"Whether or not LP-Gas and equipment should be recommended to farmers depends on the available fuel; also whether or not the tractors will operate close enough to the farm supply to make refueling easy, because transportation takes special equipment. (Ordinary LP-Gas fuel tanks for tractors have a 14-hour running capacity.) Lastly, the local price must be such that it can compete with gasoline. Balance this information against the fact there is generally more power in LP-Gas and engine operation is usually better."

So That Fewer Chickens Die

Condensed from Eastern States Cooperator

G. T. Klein
University of Massachusetts

WITHOUT immunization the control of certain of our poultry diseases would be absolutely impossible in the concentrated poultry areas. It has been the history of most of the virus troubles that once they are established in a community they never disappear.

That's the history of pox, laryngo-traechitis and bronchitis. It's almost certain that we will have to add Newcastle to this list. We have been unable to stamp out these diseases, probably because some birds that apparently recover remain carriers and spreaders. They transmit these diseases to pullets when the two come in contact, even approximate contact.

In a sparsely populated poultry area there is a chance of stamping out a poultry disease. If every bird that has had the infection is sold before there is contact between the old and young stock, there is a good chance that the infection will not reappear. But this control method can only work in an area where there is little chance of the infection reappearing from a nearby farm. It has a better chance of working, too, if there is little truck traffic between farms with feed and live poultry.

It is fortunate that lifetime immunity is established when chickens are vaccinated or have natural outbreaks of these diseases. Before vaccination or immunization came along, these diseases hit flocks in the fall of the year when egg prices were highest or in early winter when eggs were needed for hatching. The financial loss was so great that even well-established poultrymen became shaky.

Natural outbreaks of these virus diseases caused more loss than the drop in production. While this represented an almost complete loss of eggs for four to six weeks at top market prices, there was, in addition a poor quality hatching egg or market egg noticeable for weeks following. Perhaps this has been most pronounced in the case of bronchitis.

Pox and laryngotraechitis are virus infections which are easily controlled through vaccination.

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With special laboratory technique the viruses are grown in eggs, harvested and put up in packages which retain their potency for considerable periods of time. The strains of the viruses have been specially selected and are a type that causes immune bodies to be produced in the bird. When young birds are vaccinated with either of these materials, it does not actually cause an outbreak of the disease, but causes these immune bodies to be produced which give the bird lasting protection.

Laryngotraechitis practically threatened at one time to exterminate poultry in concentrated areas. Mortality was high, killing off a large percentage of the flock. Then came a vaccine and with it poultrymen thought that once they vaccinated their birds they would have to continue the program forever. That was not the case, however. The vaccinated birds did not prove to be carriers and some poultrymen took the chance of dropping the vaccinating program after a time. In most cases they were able to drop it permanently.

There is one difference between laryngotraechitis vaccination and some of the other diseases. The period between vaccination and immunization is very short, probably four or five days. Since flocks can be quickly immunized in the case of an outbreak, some poultrymen figure they can take a chance on not vaccinating. If it appears, they might have to sell off one pen of birds, but the rest of the flock can usually be vaccinated ahead of the spread of the outbreak.

There is also the possibility that the laryngotraechitis virus has become less virulent after running its natural course for many years. That appears to be what has happened in New England. Now natural outbreaks are rare and seem to take a smaller percentage of the affected birds.

There has been no such apparent change in virulence with pox or with bronchitis. If a poultryman skips the immunization program and lives in a community where these diseases have become established, he is likely to be in for trouble.

Bronchitis is a virus trouble that diseasemen have not been able to control with vaccination. But, the virus can be harvested from a bird having the infection and given to the young bird at the right age and lasting immunity will be established. This is an entirely different procedure than vaccination, but it gets the same results. There is the disadvantage that it deals with a live virus which, when inoculated into a range-age bird, can spread bronchitis to adjoining farms.

Dr. Van Roekel of Massachusetts was the first to work out a

control program for bronchitis. The procedure is to grow birds in quarantine quarters, inoculate them with a pure culture of bronchitis virus, let it develop and harvest the virus from the trachea. This virus material is introduced with a swath into the trachea of the nine- to 15-week old pullet. She goes through all stages of a natural outbreak, spreads it to other birds and the flock is immune for life.

At this early age there are no after-effects like white-shelled eggs or rough eggs provided it is done before the flock comes into production. This virus is not for sale commercially, but a number of New England colleges make it for poultrymen of their state.

Now, we in Massachusetts have had about one season's experience with Newcastle vaccination with a live virus. In the spring of 1947 some 12,000 birds in several flocks were vaccinated with a selected virus strain which Dr. Van Roekel and his co-workers harvested from birds with the disease. They checked immunity in these birds and found that after a year or more these birds still had their resistance. It looked so good that in the spring of 1948 poultrymen in Massachusetts were offered the vaccine. This was followed by the federal government granting a license to at least three commercial companies to sell the vaccine.

In Massachusetts vaccination is widespread. The recommended age is nine to 15 weeks. The needle stick method in the wing has been used and it has given a slight reaction which can be read as a swelling at the point of sticking. Occasionally there has been some coughing which lingered for a time and in some cases the twisting of the neck in a few birds.

This program of immunization makes it complicated to time the different steps. The program suggested in Massachustees and followed as closely as possible runs about like this:—

5 weeks—Pox and possibly laryngotraechitis, same time.
9 weeks—Newcastle.
15 weeks—Bronchitis.

The diseasemen hope that it may be possible to combine Newcastle and pox vaccination. That will cut the handling of all birds to one time. They will skip the laryngotraechitis vaccination in areas where it is not troublesome and bronchitis inoculation does not involve handling many birds.

Control of coccidiosis is also largely through immunization. Birds seem to be able to build up immunity or resistance through light doses of either the intestinal or cecal type. The built-up litter whether it be used once or for several broods of chicks gives early exposure. The sulfa drugs control losses, but do not interfere with the building up of immunity.

Cholera, typhoid and pullorum are bacterial diseases and there is no program of immunization to control them. Carriers of both pullorum and typhoid can be detected with the blood test. Cholera can be stamped out only by selling off.

The disease that is most troublesome in New England now is the virus infection which Dr. Deleplane of Rhode Island has done most work on. It goes under such names as "Deleplane Disease" and "Rhode Island Disease". It is a highly infectious cold which does not throw a flock entirely out of production as does bronchitis or Newcastle, but it lingers and holds production to 45 to 55 percent when it ought to be 75 or 85 percent. It spreads slowly through a flock and in a year's time, cuts profit dollars from the returns. This disease is serious enough and widespread enough to warrant considerable research on it to see if either a vaccination or immunization program can be worked out.

One by one our disease investigators are attacking these enemies of poultry. They haven't exterminated many of them, but they have made them so we can live with them. Immunization has made commercial poultry raising in highly concentrated areas possible and profitable.

Is Soil Conservation Really Worthwhile?

You hear a lot of reasons for soil conservation. But just what does it mean to the old pocket book? Does it pay *now* for the cost and the bother?

University of Illinois folks have the answer. They've compared 105 farms in Illinois. The actual cost of setting up a good conservation plan ran around $34 an acre. That's the cash outlay for fertilizers and water control; and for the additional buildings, equipment, and livestock needed to use the increased acreage, hay, and pasture.

In three years, the 40 farms that had a "high" rate of conservation returned $31.89 an acre more income than the 40 "low" conservation farms.

That would just about pay for the cost of the more complete program. And an investment turn-over in three years is *good business.*

—Farm Journal

Proteins for the Growing Pig

Condensed from the Hog Breeder

E. F. Ferrin
University of Minnesota

ONE of the most important of the factors which determines the growth rate of pigs is the quality of the protein which they receive. A liberal amount of protein will not produce satisfactory gains if there is a shortage of some of the essential nitrogen compounds. Corn and other feed grains do not have a high quality of protein and one of the purposes of adding a protein concentrate to the grains which are fed to pigs is to improve the quality of the protein intake. The high-protein feeds such as linseed meal and cottonseed meal, which are by-products from vegetable sources, do not have quite as good quality of protein as the animal source feeds, tankage, skimmilk, buttermilk and others. For feeding hogs which are not on pasture, some animal protein is desirable but good pasture crops are a protection against poor quality of protein in rations.

The Minnesota Experiment Station has conducted many tests with different high-protein supplemental feeds and with mixtures of these feeds. A simple mixture which has consistently given good results for feeding growing pigs in dry lots is the old standard Trio or Trinity combination. This consists of 2 parts tankage, 1 part linseed meal and 1 part alfalfa meal. Several modifications of this mixture can be made with little reduction in the efficiency of the feed and sometimes the cost is lowered considerably. The tankage can be reduced to 25% and both soybean oilmeal and linseed meal fed at the rate of 25%. Meat scraps can replace tankage and small amounts of fish meal or dried buttermilk will improve the feeding value of the mixture.

Alfalfa meal is a valuable ingredient in protein concentrate mixtures for dry lot feeding, both from the standpoint of protein and B vitamins. It should not be omitted or reduced below the level of 25% of the supplement mixture unless some substitute is fed. This will give growing pigs about 5% of alfalfa meal in the

Reprinted by permission from the Hog Breeder, December, 1948, Chicago, Illinois

total ration while the optimum proportion is probably seven to eight per cent. Supplementing the grain and protein concentrate fed to growing pigs with additional alfalfa hay sometimes boosts the rate of gain under dry lot conditions.

The present tendency to increase the acreage of flax in this country may lower the price of linseed meal as compared to that of other common protein supplements. While linseed meal has not been fed as extensively to hogs as tankage or soybean oilmeal, it helps the nutritional value of concentrate mixtures. In the summer of 1947 several groups of growing pigs were fed in dry lots on different protein supplemental mixtures. Pigs receiving a concentrate mixture of 75% tankage and 25% alfalfa meal made slower gains than others which were fed linseed meal in place of part of the tankage. Other feeding trials have shown better results when both of these feeds were put into a mixture than when only tankage was included. It has been recognized for many years that corn, linseed meal and minerals do not make a good dry lot ration for growing pigs. It was thought that this might be due to a shortage of the amino acid lycine but until recently it was not possible to get enough lycine to feed a group of pigs. The cooperation of du-Pont & Co. was obtained so that this point could be investigated during the summer of 1948.

Four groups of ten pigs each were fed on concrete paved lots for a period of 100 days. The pigs averaged 61 pounds per head at the start and from 203 to 222 pounds at the close of the feeding period. Yellow, shelled corn and a complex mineral mixture were self-fed, free-choice to all lots. The protein mixture fed to Lot 1 consisted of 75% dry rendered tankage and 25% alfalfa meal. Lot 2 received a mixture of 25% tankage, 50% linseed meal, and 25% alfalfa meal; Lot 3, 75% linseed meal and 25% alfalfa meal. Lycine was included in the mixture fed Lot 4 at the rate of 2% and with it 73% linseed meal and 25% alfalfa meal.

The alfalfa meal was produced from the 1948 crop and was unusually high in carotene. It contained 18% of protein. The tankage was a 60% protein dry-rendered product and the linseed meal was expeller processed, containing 34% protein. The shelled corn graded No. 3 except for 45 days when No. 2 corn was fed. Each of the four lots of pigs showed a good appetite for the rations: Lot 1 ate an average of 5.32 pounds of feed per pig daily as compared to 5.79 pounds for Lot 2. Lot 3 consumed 5.68 pounds and Lot 4, 5.32 pounds of feed daily per pig. The consumption of the protein and

the mineral mixtures was unusually high in Lot 3, but the average gain of the pigs was identical with Lot 4.

Summary

1. The average daily gain of the pigs which received tankage, linseed meal and alfalfa meal (lot 2) was greater than that of the pigs fed tankage and alfalfa meal (lot 1). More of the protein mixture was eaten daily by the pigs of lot 2 because they made larger gains and also because the per cent of protein of the mixture, 36.5, was lower than the protein of the tankage and alfalfa meal mixture, 49.5%. The mineral mixture was consumed at a normal rate by both these lots.

2. The pigs of lot 3 consumed an abnormally large amount of the protein mixture, 21% of the total ration and also a high proportion of the mineral mixture after the first 28 days of the feeding period. During the third 28 day period the lot of ten pigs ate 0.7 of a pound of minerals daily. In spite of the large protein and mineral consumption the pigs of lot 3 ate as much corn as lot 4. An unusual circumstance in this feeding experiment was the nearly identical weights of lots 3 and 4 at every periodic day of weighing and the final lot weights of exactly 2,028 pounds.

3. The addition of lycine to the ration of corn, linseed meal, alfalfa and minerals (lot 4) did not increase the rate of gain over that of lot 3. It did, however, result in a decrease of 27% in the protein mixture consumed per 100 lbs. of gain and 36% decrease in the mineral mixture. The lycine was a definite benefit in the lot 4 ration but some other additions are needed to bring the daily gains and feeds per 100 pounds gain to the level of lot 2. The rate of fattening was delayed in the pigs of lot 3 as compared to lot 4; they were narrower over the backs and longer in the legs. At the final weight, the pigs in lot 4 were a more uniform group than those in lot 3, even though the final lot weights were the same.

Soil That Breathes

Condensed from Iowa Farm Science

G. M. Browning

EVER pick up a handful of soil and let it spill through your fingers? If you picked up soil from meadow or pasture land, chances are you noticed the grainy, crumb-like texture. Those tiny particles—those "little clods"—play an important part in crop production.

By way of comparison, a handful of soil from an eroded field, or from a field that's been planted to corn or soybeans for several years, will be firm and hard. It doesn't have any crumb-like particles. When you plow it, the "clods" are large and lumpy.

The difference you feel in these two soils is due mainly to **soil aggregates.** These are the "little clods," the particles that run through your fingers. Meadow soils are apt to have a good structure, lots of aggregation. Overcropped soils may have very little or none at all.

We haven't yet learned how to measure the exact effect of these soil aggregates on crop yields; but we do know that they make the soil more productive. Here are some things we are sure of:

● Soil aggregates form a porous structure; they make it easier for moisture and air to move through your soil. The soil "breathes."

● This porous structure aids the growth of soil organisms.

● And soil organisms, in turn, affect both the amount and the availability of soil nutrients.

● Soil aggregation makes for a grainy, more porous soil—one that drains better and resists soil and water run-off.

Too often we think of our soil fertility only in terms of soil nutrients. Actually, nutrients are only part of the productivity problem. There are many cases where soils that contain all the plant nutrients (from a chemical standpoint) needed to produce big yields **do not produce those big yields.**

They don't produce them because soil structure has broken down. And as a result, crops are not able to make best use of the elements that are in the soil even though the needed elements are plentiful.

Only when your soil "breathes," only when air and moisture can

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move freely to make the necessary food elements available to plant roots, will you get the highest yields that your soil is capable of producing.

Our virgin prairie soils probably had about the best structure it is possible to have. This structure was developed by years—centuries—of continuous grass. It was a porous granular structure; one that permitted free movement of air and moisture. It absorbed the rains readily. And elements in the soil were freely available to the plant roots.

The aeration made possible by the granular structure encouraged the growth of soil microbes. They flourished—aiding the decomposition of organic material and helping to add nitrogen to the soil.

It was this fine structure that made our virgin prairie soils so productive. True, they were abundant with plant foods and soil nutrients; that was part of it. But it also took soil aggregation, a structure that made the nutrients available for plant use and held the needed moisture, to produce top yields.

Naturally it is not practical to maintain this kind of soil structure on our farms today. The soil structure that was built up by centuries of grass can be maintained only by continued growing of grass. We can't crop our land and expect to maintain this level of structure.

On the other hand we can't afford to forget the importance of good structure. Even though we maintain fertility in the chemical sense, our soils won't stay productive if we allow structure to break down too far.

How can we maintain structure that will give us high production along with full use of our land? To do this we must understand some of the things that cause soil aggregation. What causes these small soil particles to stick together? What things will prevent the formation of soil aggregates—break down soil structure? Finally, we must adjust our farming practices to get as much aggregation in our soils as is possible along with intensive cropping.

Soil aggregates increase when soil alternately freezes and thaws. Aggregation also is helped along when soil goes through cycles of wetting and drying. Even though such things are out of our control, we must consider them in making our other practices effective.

Some soil organisms are active in the formation of soil aggregates. And over these we do have a little influence. These organisms break down crop residues and form materials that bind the soil particles together.

Then the organisms themselves die; and the materials in their bodies help cement the soil particles together into soil aggregates.

If our soil has good tilth, if crop residues and barnyard manure are returned to the soil, if lime and fertilizers are added when and where they are needed, and if moisture conditions are favorable—then we can look for the action of these soil organisms to increase.

Roots also play an important part in aggregate formation. Grasses, with their fibrous root systems, build good soil structure. Corn and soybean roots do relatively little to build structure. What benefits are obtained from the root systems of these crops do not offset the destructive effects of cultivation on structure. In general, including a grass-legume in the rotation is necessary for the sake of soil structure.

Soil types, too, make a difference. Light, silty soils break down easily; they need more years of meadow to maintain structure. Soils that contain equal amounts of clay and silt are favorable to aggregate formation; the clay helps bind the soil particles.

Silt by itself, however, does not form aggregates very well. More years of meadow are needed to maintain structure in soils such as Ida and Edina than in soils containing more clay.

Some tillage implements—such as the disk—help to destroy aggregates by cutting and pressing. But the amount of moisture in the ground when soil is worked also makes a big difference. Heavy clay soils are cloddy when plowed dry. If plowed when too wet, then they become "puddled" and run together badly.

By working soil when it has just the right amount of moisture you can make it easier for soil aggregates to form. But in general, tillage is more apt to break down soil aggregates than to build them up.

Soil structure is not a very permanent thing. Legumes and grasses build up structure quickly in a few years. Then, when these sods are plowed up and cropped, the process of structure deterioration begins.

Some sods break down faster than others. In most of our experiments alfalfa "sods" have broken down faster than bluegrass sods. "The grass roots are the hair in the plaster . . ." They resist the breakdown of soil aggregates better than legume roots; a more lasting structure results.

We've been studying the problem of soil structure under different rotations in Iowa, at the Agronomy Farm at Ames, at the Soil Conservation Experimental Farm in Page County, and at the Albia Pasture Farm near Albia. We've found that good rotations can maintain soil structure at a fairly high level.

The table shows the aggregation that resulted from various crop rotations. We measured this

structure on the basis of the percent of soil aggregates larger than 1/13 inch in diameter. These are the larger aggregates that you can see with your eye.

Here's How Different Crop Rotations Built Up (or broke down) Soil Structure at the Albia Pasture Farm 1945-46.

Crop Rotation	Aggregates Larger Than 1/13 Inch
	(percent)
Continuous Grass	26.2
C-O-M-M	14.8
C-C-O-M-M	12.3
C-O-M	10.8
C-C-O-M	10.6
C-O (Sw Cl)	8.0
C-O	5.5
C (Sw Cl)	4.0
C-Soybeans	3.7

But it takes more than a good rotation to maintain a good soil structure. With too much grass and too few legumes soil may become sodbound. When this happens the corn crop that follows will suffer from lack of nitrogen.

Plowing your cornstalks back into the soil instead of burning them adds organic matter and improves soil structure. Grain straw is often removed from the field where it is produced and used for bedding of farm animals. After it has been used as bedding, it should be returned to the soil as farmyard manure.

Soil and water losses too are directly affected by soil structure. Aggregation makes for a more porous soil. The porous structure absorbs water better; it resists the forces of erosion. Obviously, it is the water which does not soak into the soil that causes erosion.

Experiments at the soil conservation experimental farm show this very clearly. Where corn was grown continuously, average soil losses have averaged about 38 tons per acre per year. Where a corn-oats-meadow rotation was followed, we lost an average of 10 tons of soil per acre per year. These figures will vary a good deal with different types of soil; but they show how the rotations affect structure—and erosion.

When your soil structure does break down, each hard rain churns up the fine soil particles; and they plug up the openings in the soil. Since it is through these openings that the water is absorbed into the soil, this surface sealing causes a lot more water to run off than would otherwise be the case.

Some of these things are well illustrated by the last two seasons. In 1947 the wet cold weather up until July 1 discouraged the growth of soil microbes. There were no alternating wet and dry cycles—it was all wet in

the early part of the season, all dry later on.

Seedling roots didn't develop much during the cold wet weather in the spring of '47. Later on when the corn needed a lot of moisture and plant food for rapid growth to maturity, the roots couldn't develop fast enough to keep up with the disappearing moisture.

This season (1948) the soil, moisture and temperature conditions have been almost ideal. Our spring weather favored the growth of soil organisms; frequent rains gave us the wetting and drying action in our soils. Even our overcropped land is producing good crops this year.

Last year there was a good deal of concern over the way some fields didn't produce. Under the extreme conditions, differences in soil treatment were bound to show up. This year the opposite is true—excellent weather and growing conditions can cover up a lot of deficiencies in our soil.

But the difference is still there. Bumper yields under ideal conditions may hide the real facts from us temporarily but cannot alter them. There is a big difference in soils—and part of it is soil structure.

Dairy Pen Barns?

Condensed from the Dakota Farmer

RESEARCH was started in 1941 to find out whether pen barns would be satisfactory for Wisconsin dairy herds. The investigators knew that advances in cattle breeding, feeding, and quality milk production had far outstripped improvements in housing and chore reduction. A six-year summary of the work shows that pen barns have a number of definite advantages over the ordinary stanchion barn.

Originally, two prefabricated steel barns were built—one a conventional stall barn and the other a pen barn. A south door of the pen barn was left open at all times and the herd was milked in a milking parlor. A manure pack was allowed to accumulate in the pen barn to furnish a warm bed for the cows and was removed only once or twice a winter.

Since there were two main differences between the pen and stall barns—the temperatures and the freedom allowed the cows—

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there was no way of knowing which caused differences in performance. A second pen barn, insulated and kept as nearly the temperature of the stall barns as possible, was completed late in 1944. Here a new method of steel barn construction was devised to overcome wartime shortages.

Briefly, the advantages of the pen barns over the stall barn are lower construction cost; flexibility as to use and herd size; fewer injuries to cows, and a saving of labor. The principal disadvantage of the pen barns is the extra bedding required. For a properly planned pen barn, with no feeding on the bedded area, this increase in bedding is about 50%. This extra cost for bedding, may be offset by the well-prepared manure in the bedded area of the pen barn.

The warm insulated pen barn has no apparent advantages over the cold pen barn except for slightly better calf gains. It has the disadvantage of a soggy manure pack, a pronounced odor and stuffiness even when extra bedding is used, and takes a little more labor.

Some of the disadvantages of the pen barns, which showed up in earlier years, have been eliminated or reduced. Some thought-to-be disadvantages, it turns out, were caused by differences in the herds.

Test periods during the past two years ran from November 14, 1945, to May 1, 1946, and from November 1, 1946, to May 1, 1947. The average temperature for A barn (the stanchion barn) was 51.21. For B (the warm pen barn) and C (the cold pen barn) the average temperatures were 48.03 and 37.52. The average outside temperature was 29.71.

The actual water vapor content of the air in C barn and outside was much lower than in A and B barns, though the relative humidity of all four places was high—between 70 and 80%.

Floor temperatures of the stall barn, for the 1946–47 winter, averaged 54.35. The manure pack temperature in both pen barns ran between 80 to 100 with an average of 88.8 for B barn and 88.9 for C barn. Thus, the temperature of the barn had little or no effect on the actual heat generated by the manure pack.

Over-all time study results show a saving of from 1 to 15% labor for the pen barns, with an average saving of from 8 to 10% for all operations. C barn took slightly less time to operate than B barn. The differences in working time for the three barns are small enough so that such things as the enthusiasm and ability of the workers, available equipment, and convenience could swing the favor in either direction.

Feed consumption was a little higher in the pen barns than in

the stall barn—but the herds in B and C barns ate more roughage so the actual cost of the feed, figured as the cost of total digestible nutrients, was slightly lower per pound of milk produced for the pen barns.

The C barn cows were willing to eat poorer quality feed than the cows in the warm barns. In the stanchion barn the cows occasionally refused to eat, or ate only part of the feed before them when it was of poor grade.

The amount of bedding used varied considerably. B barn used 148.7% more bedding than A barn in 1945–46 and 74.7% more during the next winter. C barn used 129.1% more than A barn in 1945–46 and 42.2% more in 1946–47. The differences between the two winters are explained by the amount of control exercised in bedding.

Early in the barn experiments it was thought that 2½ times as much bedding would be required for pen barns as for stall barns. The 1945–46 and 1946–47 records show what can be done to reduce the amount of bedding used by improved bedding practices. The chief measures are throwing the manure to the outside of the pack daily, which takes about one-half man minute per cow, and paving the area in front of the feed manger and cleaning it daily.

As a whole there was little difference in the amount of milk produced or production costs of the herds in the three barns. C barn had a slight advantage the last two years, and A barn had the advantage earlier in the experiment.

There were no differences in milk quality big enough to indicate an advantage for any of the barns. Bacteria counts, tests for odor, flavor, sediment, and for thermodurmic bacteria in the pasteurized milk during the 1946–47 winter showed practically no differences.

When the barn experiments were started bacteria count for milk produced by the C barn herd was a little more than three times that of the A barn herd's, largely because the C barn cows were dirty. Paving the feeding area in C barn and some minor adjustments brought the count down to approximately that of A barn. In one test period it was lower.

Cow injuries in the pen barns were much lower than in the stall barn. That was particularly true of such minor injuries as stiffness, lameness, foot rot, knee and hock injuries, and injured teats. Some of the injuries affected production, and may explain why production was slightly lower in A barn. Mastitis records were kept, but there was no apparent relationship between mastitis and the type of barn. There has been no trouble from "boss" cows in any

of the barns, possibly because the cows were dehorned.

The cows in the stanchion barn are uneasy when first stanchioned in the fall—especially first-calf heifers—and many of the minor injuries occurred during the first month or so after stanchioning. Along with the uneasiness came a production lag, which may have affected the total production in A barn materially.

Over the years the barns have been in operation, cows in all three barns have made an average gain in weight. The cows in A barn lost considerable weight two of the six years. Those in B and C barns have never lost weight.

The cows in C barn seemed to be better able to stand cold weather than those in the warm barns. The C barn cows enjoyed spending a good part of the day out-of-doors and often stayed out for some time in the evenings, even in very severe weather.

Cold weather and low barn temperatures had no effect on the milk production in the C barn herd, even though the barn temperatures ranged from 60 down to –5. In both warm barns milk production fell off during very cold weather when the temperature inside the barns fell toward 40, and increased as the temperature rose.

The services - per - conception rate was a little better in C barn than in the stall barn probably because of the ease of catching heat periods in the pen barn.

The general health of the calves has been good in all three barns. During its operation B barn calves have gained best, with A barn next, and C barn last. However, the differences have been small and all calves did well.—Wisconsin Experiment Station Bulletin 474.

"Mechanical Cow" May Sell More Milk

A new mechanical gadget may step up the market for powdered milk. Called the "Kitchen Kow," it mixes dry milk and water to make a product very close to fresh milk.

It is a household version of the "mechanical cow" that provided "fresh" milk for service men all over the world during the war.

The "kow" runs by electricity, is small enough to go on the kitchen table. One thing that may limit its use is its price—$55.

—Farm Journal

Farmers Under Our Feet

Condensed from Frontiers

N. J. Berrill

MANY animals look to the future either as individuals or as communities. In fact, all reproduction is primarily an effort to project the race forward in time beyond the life span of the single organism. Some animals go to unusual lengths to insure the survival of their progeny; others, demonstrating more vividly the organismal character of the race or species, maintain the identity of colonies or societies over prolonged periods by means of practices often considered to be purely human activities. In spite of their small individual size, insects, especially the social insects, have exploited the living world around them to an extent comparable only to the domestication of animals and plants by man. So we find them gardening storehousing, and even cattle-tending; and not even as solitary examples but independently in several distinct insect groups.

Fungus gardens are maintained by ants, beetles and termites. The most spectacular of these are the Parasol ants, so named not for proficiency as cultivators but for waving leaf banners as they travel their forest highways. They are the Attas, inhabiting the savannas and forests of South and Central America, Mexico, Texas and Cuba.

Hordes of large worker ants go out along trampled paths of their own making and often defoliate the bushes and trees they encounter. Each ant cuts a piece out of a leaf larger than itself with its powerful cutting jaws. This is then carried like a parasol or banner as the ant staggers homeward. The long, seemingly endless, parade of the army of leaf-cutters struggling along their highway is a sight never to be forgotten.

Near the nest they are met by smaller workers that jump on their backs and enter the nest with them. Within the nest the cutter is relieved of his burden and the small workers take over. They cut and chew the leaf pieces into pellets mixed with fluid from their mouths. These are implanted in the floor of the nest chambers as fertilizer for a fungus, or within the crypts of the fungus if it is already well established. The filaments of the fungus pro-

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Academy of Natural Sciences, Philadelphia, Penna.

duce clusters of small spherical swellings, the bromatia, which are eaten by the ants and fed to their larvae.

The fungus grows to form large cauliflower-like masses, and each species of Attas cultivates its own particular kind and allows no other to grow. It is prevented from producing mushrooms either by some action of the ants, or by the special underground conditions of its growth. The food nodules do not appear when the fungus is artifically cultivated and are almost certainly induced by the ants. Sometimes nests may be enormous, those of one of the Brazilian species containing up to 600,000 individuals in a colony.

Fungus-growing demands a humid atmosphere and, while the more primitive species of cultivators are consequently confined to the rain forests, some species have colonized even the dry deserts of Arizona and Mexico by sinking their galleries and chambers to a greater depth.

New colonies are established by the queen. Before leaving the parental nest on her marriage flight the virgin queen takes a large meal of fungus. After mating, she throws off her wings, makes a small chamber in the soil and then casts the pellet of fungus from her mouth on to its floor where it starts to grow. The young on hatching eat the fungus and emerge as workers capable of cutting leaves and relieving the queen of everything but the laying of eggs.

A comparable habit has developed among the beetles of the family **Ipidae,** known as the Ambrosia beetles. They run their galleries right into the wood of healthy trees, the female doing the work, cultivating the fungus, and seeing to it that the larvae have fungus available even in their cradles. One of the tropical species has a tendency to bore into the wood of barrels of beer, wine or rum and has consequently been awarded the name of "Tippling Tommy."

Termites, however, are more serious competitors of the ants as underground farmers. The nests contain a number of large spherical chambers surrounding the royal cell with its queen and king, and connected with it by galleries. Sponge-like masses from about one to six inches across are found in each chamber. The masses are made up of vegetable matter that has been chewed up by the workers, passed through their intestines and built up so as to afford a maximum surface for the growth of fungi. The fungus is probably sown automatically since the termites feed upon fungus-infected wood. The subterranean gardens in which it is grown are really the nurseries and are usually full of little white, newly-hatched young. Neither workers

nor soldiers feed upon fungus, but the king, queen and other reproductives are all supplied with the same food as the young.

Insects in general appear to live in a world mainly of taste and smell and the various secretions produced by their bodies have a strong attraction at least for some of them. This has led to some curious relationships among insects either living in the same nest, or occupying the same feeding territory. Nearly all plants, for example, are infested with aphids. These pierce the integument of the plants to imbibe the sugary juice within, most of which is later excreted to drop on the plant surfaces to form "honey-dew."

Ants are interminably searching for liquid food, though unable to pierce plant stems themselves, and some merely lick leaves and stems on which the honey-dew has fallen. On the other hand many species have gone further and treat the aphids as cows. They have learned to stroke them, causing the liquid to exude gradually so that it can be drunk directly. A single drove of plant-lice may in this way support a whole colony of ants for a long period. Scale-insects and mealy-bugs are similarly exploited, while some ant species construct little closed sheds or barns for the protection of their cattle and themselves. They may even collect aphid eggs to be incubated much as we do chicken eggs, only they grow cows and not poultry.

Apart from an active cultivation of plants and animals, many insects store food in large quantities either for the benefit of the next generation alone or to maintain a uniform sustenance of a colony through times good and bad. The solitary wasps are notorious in this connection. A large grub or caterpillar is captured and stung until paralyzed and dropped in the burrow of the wasp. She then glues an egg to its surface, closes the burrow with sand or dirt, and goes off to repeat the process. The egg hatches and the larva finds an abundant supply of ready food perfectly preserved by the antiseptic properties of the wasps' venom. Dung beetles behave in an analogous manner. As the name implies, they feed mainly on dung. When breeding, however, each male and female pair dig a chamber, fill it with dung and cut the mass up into four spherical pellets in each of which an egg is laid. The mother stays on guard and keeps fungus from developing for several months while the larvae are developing within.

Storage of food in colonies of social insects is accomplished in several ways. Many termites store vegetable matter of various kinds. One African species stores large

masses of grass, cut into pieces about two inches long, as do others in Australia and South America, while an Indian form stores particles of lichens. Harvester-ants collect, husk and store grass seeds in special granaries in the drier parts of their nests.

Honey, which appeals to so many insects, is stored by ants as well as bees. During periods of active plant growth honey-dew is usually plentiful and they can collect more than is needed at the time. An ant crop is always capacious but in the honey-ants becomes enormous, and certain individuals are stuffed with honey until they become distended and perfectly spherical. Unable to walk they are suspended from the ceilings of the nest chambers, ordinary workers stroking their heads and receiving regurgitated droplets of honey as they need it. In Australia the aborigines regard the nest of a honey ant as a luxury.

Bright Future for Beef Breeding

Condensed from the Shorthorn World

Dr. W. H. Peters
University of Minnesota

THAT the production of high quality beef in the United States is below the present demand for it at profitable prices is common knowledge. Many farmers who cannot do so would like to be fattening a group of good beef steers or heifers this winter. The reason many would like to be fattening some cattle is because they have a large supply of corn and feeds suited to fattening cattle. The reason many cannot proceed with a cattle fattening enterprise is because enough feeder cattle to supply the demand cannot be found. This situation contributes toward keeping up the cost of feeder cattle thus endangering the profits from the enterprise. In the judgment of the writer, this situation will become more acute before it begins to improve and unless a change takes place in the present trend in beef calf raising, there promises to be a long period of beef cattle shortage. This in turn will stimulate such a demand on the part of consumers that the beef distribu-

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tors will begin to look beyond our borders for good quality, lower cost imported beef.

Throughout the World War II period and the several years following, range cattle production has been maintained in a large volume. Range production has been stimulated by high prices for cattle, by several successive years of favorable climatic conditions and some replacement of sheep by cattle in some of the range areas. It is hardly to be anticipated that numbers of range raised cattle will continue to increase. It is more likely that less favorable climatic conditions and some return to sheep on some of the ranges will bring about some decrease in range production during the next five to ten years.

During the war period the trend in beef calf raising in the mixed farming areas has been downward. Competition from dairy cattle, hogs and poultry during the war years; a trend toward planting more of the acreage on mixed crop farms to cash crops and the spread of Bang's disease in small herds of breeding cattle may be cited as contributing causes to this downward trend.

That there is a need for the raising of more beef calves during the next ten years and that their production will continue profitable is the common belief of nearly all persons concerned. If beef calf numbers are to be increased, it is evident that the one place where they can be produced is in small to medium sized herds maintained on the mixed farms of the Corn Belt and other mixed farming areas.

For many reasons many farmers in mixed farming areas who greatly reduced or eliminated livestock entirely during the war years will be developing livestock enterprises on their farms again during the next several years. One of the most important reasons for this return to livestock will be the need of a change in the cropping plan to reduce the amount of cash crop production, stop erosion and begin the building up of the soil again. Introducing a soil conservation program on most farms usually begins with the seeding of more of the land to pasture and hay crops. Grazing the pastures with beef cows and feeding the hay to them is one of the simplest, most effective and generally profitable ways of utilizing the pasture and hay fields. Another advantage of the breeding herd of beef cows on the mixed farm is that their maintenance requires only simple, low cost housing construction and comparatively low labor requirement in caring for the cattle. A beef cow herd, therefore, can be added to many corn belt farms with minor adjustment of building and labor needs as compared to operating on a cash crop plan.

Many indications suggest the

present as an opportune time to increase or establish new beef cow herds on mixed farms. Perhaps the two principal problems involved in proceeding to do so are the problems of buying the breeding stock and attempting to eliminate the risk of Bang's disease infection. By taking a little time, proceeding cautiously and conservatively, it is possible to buy grade beef heifers or cows in small numbers with which to make the start. It may not be possible to procure as many as desired or to get them of as high merit as one would like, but by being a little less demanding as to the quality of the females, then aiming to improve the herd promptly by buying a good purebred bull for a herd sire will prove a highly satisfactory procedure. In that way a start can be made and numbers increased by retaining the desirable heifer calves in the herd. Under present circumstances, that is the only way by which we may get beef cattle numbers on the increase again.

Breeders of purebred beef cattle have kept numbers up better than have the commercial producers. It is, therefore, easier to increase or start a purebred herd by purchasing females than to start a grade herd. In proportion to their normal value in times of moderate prices, purebred females can be purchased at present with less risk of a drastic decrease in value than may be true of non-registered females.

To make the most out of the investment in the cow herd on the mixed farm, the management plan for the commercial herd generally should be to allow the calves to nurse their mothers, creep feed them grain and put them in the feedlot immediately following weaning. They may be full-fed from the beginning and be marketed as fat "short" yearlings or they may be carried along more slowly and be marketed as fat "long" yearlings. In the latter case, it is advisable to feed well enough through the winter so that the benefit of the mother's milk and the creep feeding will not be lost.

If the start is made with purebreds, the care, feeding and management can be much the same as with the commercial herd; the bull calves, which at an early age give promise of making satisfactory herd bulls, being retained. At weaning time the bulls and heifers selected to be developed for sale as purebreds must be taken out and given different care and feeding in order to develop them satisfactorily.

In either the commercial or the purebred herd, care should be exercised to purchase suitable purebred bulls for herd sires. How high in merit the bull should be and the price to be paid must be

determined by the number and merit of the cows in the breeding herd.

A precaution that must be kept uppermost in connection with herd management and purchasing at all times is to do everything possible to avoid an infection of Bang's disease getting into the herd. While control of this dread disease seems far from being solved, much more is known about it than was available ten years ago and many cattle men are now getting along with little or no loss from it.

Is the Bounty System a Farce?

Condensed from Nature Magazine

David Hellyer

Is the bounty system approaching the status of a national farce? Will bounties become a thing of the past in the near future? Evidence exists to support this possibility.

Although at least thirty-three states still provide legally for payment of bounties for the destruction of so-called predatory mammals and birds, the bounty system, as such, appears to be largely in disrepute among professional fish and game officials and wildlife technicians.

For many years, the U. S. Fish and Wildlife Service has frowned upon bounty payments. Representing a widely held view, Clifford C. Presnall of the Service states the case against bounties this way:

"The federal government does not offer bounties because it has been determined by long experience that bounties are not an economical and efficient way of spending money for the control of predatory animals. Such measures often result in a spectacular and sudden decrease in predator populations in areas where surpluses of the animals exist, but the bounty system has proved ineffective in making any appreciable reduction in the basic breeding population of coyotes. With animals that have a lower rate of reproduction, the bounty system may at times prove effective."

Officials of several states report sentiments paralleling those of Presnall, although some cite

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other reasons for disapproval of the bounty system.

Said Colorado: "Bounties tend to build up illicit interstate traffic. For example, we have a bounty on mountain lions, which we are endeavoring to do away with, and Utah has a bounty on coyotes. As a result, Colorado coyotes are taken to Utah to collect bounties, . . . and mountain lions are brought into Colorado in an effort to obtain bounties. Such conditions naturally increase our costs of administration and law enforcement. We of this department are thoroughly convinced that bounties paid by individual states are of no particular benefit."

Convinced that predator control bounty is "barking up the wrong tree," Nebraska officials recently contacted game experts in eight neighboring states with a questionnaire on bounties. Results of this survey are challenging.

Of the eight contacted, five states answered "no" to the question: "Do you feel that bounties offer an effective control on predators?" These included Utah, Kansas, Colorado, North Dakota and Missouri. One (South Dakota) stated that bounties had a "questionable" effect on predators, while Utah contended that bounties "help." Wyoming ventured no opinion on this point.

"Bounties are not effective in controlling coyotes," Kansas admitted. "We have more than ever, despite the bounty."

Missouri reported that "the Commission does not contribute to the payment of bounties. We have been unable to find evidence that doing so is important to predator control. The coyote population has definitely increased during the years since bounty payment became popular."

North Dakota advised that strong sentiment for bounties exists among farmers and sportsmen, but that, in the opinion of the game department bounties are "ineffective."

"Our conclusion," asserted Michigan, "after studying the bounty system in Michigan and its effects is that bounties cost a lot of money and produce no demonstrable effects on either the bountied predators or their natural prey." Michigan should speak from experience, for since 1869, Michigan has spent over $1,120,000 in bounty payments!

Mr. David Hellyer recently completed an exhaustive survey of bounty systems in the United States. During this research, Mr. Hellyer personally checked the fish and game codes of every state in the Union. Fortified with information gleaned from nearly 200 volumes of law books, he prepared personalized questionnaires, addressed in each case to the fish and game director of each of the

48 states. He reports the results of this extensive search below.

Nebraska, whose game department sponsored the eight-state survey, reports herself, also, on the "no" side on bounties.

"Bounties on coyotes, wolves, foxes, bobcats and other predators have actually had a thorough trial in many states, and under a variety of local conditions," an official reports. "A study of happenings of the past leads to one conclusion—that bounties cost a lot of money without producing any important control upon the bountied animals."

Shortage of natural food, rather than blood lust or wanton desire to kill, may be the answer to coyote predation, the Nebraska report stresses. "The coyote is a trader—you take the rabbit and he'll take the chicken."

"Memory tells us," the Nebraska report states, "that a good rabbit crop or two will be much more effective than bounties in lowering the damage to domestic animals by coyotes."

"Mass drives have done a great deal of harm to the rabbit population," the bulletin continues, "and the destruction of coyotes has probably been more than offset by the wholesale slaughter of rabbits, which are the coyote's usual food. Rabbit scarcity, from both hunts and natural causes, has undoubtedly done much to focus the coyote's attention on domestic poultry."

For 68 years, coyotes have been on Nebraska's bounty list and the coyote population has "gone up and down anyway." During Michigan's 80 years of experience with bounties, "various predators have passed through the phases of their natural cycle, now up, now down, just about as they would have done had no bounties ever been paid." And it cost Michigan more than a million dollars to learn that lesson!

These observations would strengthen the naturalist's point of view on the "balance of Nature," which argues that Nature, left to her own devices, will strike the most wholesome balance in the bird and animal kingdom.

Still fresh in the memories of most naturalists concerned with preserving this vital balance is the tragic story of over-control in Kaibab National Forest, on the north rim of Grand Canyon. About 1907, U. S. Forest Service and Biological Survey officials determined to exterminate the mountain lions and other predators in the Kaibab, convinced that only by such drastic measures could they "save" the deer in the Kaibab. The slaughter began, and continued until 1919. By that time, one government hunter, had single-handedly, killed more than 600 lions in the area.

Then Forest Service officials surveyed the results. They were appallingly different from those anticipated. An official National Park Service report tells the pitiful story:

"The cougar, bobcat, wolf and eagle were all completely exterminated by 1919. The deer increased and reached such numbers that they ate more forage than the forest could produce. By 1924, more than 1700 deer were counted in one meadow. The deer kept increasing and the forest diminishing. Winter came, and deer died of weakness and starvation, and those that lived ate every leaf and twig they could reach, until the whole country looks as though swarms of locusts had swept through. It will probably take fifty years of careful game management to cover the scars. If there had been moderate hunting of both deer and predators, the situation in the Kaibab would not have occurred."

This is substantiation of the naturalist's contention that man is not qualified to eliminate predators. In his predatory habits, man is not selective; in fact, he prefers the fit to the unfit, taking the best head of horns, the healthiest and largest game birds, the biggest and best in everything.

Birds and beasts of prey, on the other hand, thin out the weak and below-par. Diseased and unfit animals fall first. The hawk singles out the ailing quail; the cougar finishes off the unfit deer; the coyote makes short work of the sick cottontail. And even in their predation on herds of cattle and sheep the coyote and lion thin out the below-average animals first, thus doing the rancher a service. So go the naturalist's arguments, and they are supported by fact.

What of the much-touted destruction of game birds about which bounty supporters complain so loudly? Here again Nebraska experts come forward with an opinion.

"Most of the investigations concerning predator control have been conducted by agencies interested mainly in game birds and other animals. This has been done because of the common belief that predators hold down the game supply. These investigations can be summarized by the following statement: predation is a minor item in determining population trends of upland game birds such as pheasants, quail, grouse, etc.

"Quail and foxes both exist in high numbers in southern Iowa and in Missouri," the Nebraska report continues. "Foxes and coyotes are present in Nebraska's better quail territory. Coyotes are numerous in the world's best pheasant range in South Dakota, Nebraska and North Dakota. Both coyotes and sharp-tailed

grouse are numerous in Nebraska National Forest."

The Commonwealth of Virginia reports that "our Commission discourages the payment of any bounties."

Evidence is ample that the bounty, in most states, is more of a political football than a serious effort to control destructive mammals and birds. Pressure is brought to bear on legislators to enact bounty laws; they do so in order to keep peace in the political family. In some instances, where an unusually serious predator problem has caused real alarm, legislatures have enacted bounty laws in an honest effort to solve the problem.

In a great many instances, such laws merely empower the county, village, or some other political subdivision to pay such bounties as they may "deem advisable." For the most part, counties do not "deem advisable" such payments, although there are exceptions, of course. During the period from 1944 to 1946, 93 counties in Nebraska alone paid out $33,000 for 33,000 coyote scalps. Virginia is typical of the opposite viewpoint. Referring to the state law authorizing county boards of supervisors to pay bounties, the executive secretary of Virginia's Commission of Game and Inland Fisheries comments:

"Very few counties have availed themselves of this privilege."

Which birds and mammals are the principal targets of the bounty advocates? The writer's nation-wide survey shows that the crow ranks as "Predator Number One," insofar as legislation is concerned, with the English sparrow trailing close second. But even these birds have their islands of safety, with five states protecting crows and eight offering haven to the sparrow. Eleven of the 48 provide safety for the great horned owl, the rest putting him on the "wanted" list. Runners-up for the title of "most unpopular bird" are the Cooper's and sharp-shinned hawks, the goshawk and the starling, although the gamut runs from blue heron to blackbird, and from eagle (excluding the bald) to buzzard.

Among the bountied mammals, the wildcat is most sought, even outranking the coyote in the total number of states outlawing him. The wolf and fox top the reward list in "dollar value," bounties as high as $100 being offered for the former. Close to 80 different birds, mammals and reptiles were outlawed.

Could this nation-wide trend away from the bounty system presage a trend toward wider acceptance of the balance-of-Nature viewpoint? It seems unlikely that the near future will see it. Yet predator control, in years to come, might wisely be returned to Nature herself who practices it with superior wisdom.

Care of Unborn Litters is Vital

Condensed from the American Hampshire Herdsman

Virgil Bachtel

EVERY year thousands of farmers are grievously disappointed when they see their brood sows farrow unsatisfactory litters. In many cases the number of pigs in the litter is small, or the pigs are so weak they either die or live to become unprofitable runts. Most of these cases are due to the improper care and feeding of the bred sows. Yet the needs of the bred sow are relatively simple and easily met.

Perhaps no one element is of as great importance in the securing of satisfactory profits in the swine business as this one. A careful look into the essentials will show a need for efficient rations that are laxative and fully meet nutrient requirements. Care should be taken to feed the right amount and not get the sows too fat. They should be housed in comfortable quarters and receive plenty of exercise, and the freedom from lice and worms should not be overlooked.

The nutritive requirements for swine are relatively simple, and it is not necessary to feed complicated or expensive rations to secure the best results.

Since cereal grains compose a large share of the ration for swine it is essential to provide additional good quality protein of which at least part should be of animal source. This is necessary to provide certain of the essential amino acids which cannot be synthesized by swine from plant proteins.

Cereal grains are all low in calcium and unless it is supplied in some of the other feeds in the ration it should be supplied in a mineral supplement. Phosphorous should be added in most cases and in certain areas iodine is necessary to prevent goiter and "hairlessness" in the newborn pigs. They should also be supplied with salt.

Wherever possible the sows should be kept on pasture. If this is not possible they should be supplied with some high quality legume hay. This will greatly reduce the cost of pork production and prevent deficiency of vitamins A and D. It also aids in meeting the protein requirements.

Protein supplements of animal origin such as tankage, meat scraps, dairy byproducts, and fish

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meal are of especially high value for brood sows. Next to these feeds come legume hays, soybean oil meal, peanuts and peanut oil meal.

A ration consisting only of grain and grain by-products is unsafe to feed over a long period of time. Even when a suitable mineral mixture is fed there is apt to be a deficiency of vitamin A and D unless the ration contains yellow corn and the sows receive plenty of sunshine.

One very good ration consists of grain supplemented with one pound of protein to each ten pounds of grain fed and high quality legume hay at will.

There are numerous rations that can be worked out that will be properly balanced and economical for various areas.

A sow that is too fat may have weak pigs, and may be restless and clumsy at farrowing time, increasing chances of mashing the pigs. A sow that is too thin lacks reserve energy necessary to nourish her pigs properly before and after birth.

A mature sow that is in active, vigorous condition at breeding time should gain 75 to 85 pounds by farrowing time. This is about the amount lost at farrowing and while nursing the litter. A larger part of this gain should be made during the last part of the gestation period than during the first part, because most of the growth of the unborn litter is made at that time.

Mature sows in good condition should be fed about .8 to 1 pound of concentrates per day per 100 pounds of live weight the first 10 to 12 weeks; and 1.4 to 1.6 pounds the last 4 to 6 weeks of the gestation period.

Yearling sows and gilts should be fed somewhat more liberally in order to provide for their growth.

Although they will eat much more than this if allowed to do so, it should be remembered that having sows too fat can be hazardous. If they do some lusty squealing and ambitious hustling for additional feed, it is a healthy sign and provides exercise that is so essential.

The importance of clean fresh water should not be overlooked. Water is the cheapest essential and perhaps the most often neglected part of the ration. A heated waterer will pay big dividends for most hog breeders.

Sows can easily be made to exercise by feeding them at some distance from their sleeping quarters. During times of heavy snowfall it is wise to force the sows to exercise, first making paths for them through the snow drifts. Ashes should be spread over icy places to prevent the sows from falling. Such a fall could cause the sow to abort her litter.

Adequate shelter need not be

expensive. The essentials for healthful winter shelter are freedom from dampness, good ventilation without drafts on the animals, a moderate amount of dry bedding, reasonable warmth and sunlight. The quarters should be located on well drained ground and should be arranged so as to make thorough cleaning and disinfection easy.

Central farrowing houses, small portable houses, or colony houses can all be used to good advantage either by themselves or in various combinations.

Banking around the houses with corn stalks, straw or horse manure can often be done to make an inexpensive shelter amply warm. And a strong sack hung over the door will shut out many drafts, yet allow the sows to go in and out of the houses at will.

The sows should be moved to farrowing quarters at least a week before farrowing time so that they can become accustomed to them. Before moving the sows they should be washed with soap and water, and the farrowing quarters and equipment should be scrubbed with boiling lye water. The use of guard rails in the farrowing house will lessen the chance of pig losses from mashing.

Utmost care should be exercised to have the sows free from lice and mange before farrowing. A litter born to a lousy or mangy sow has two strikes against it when it is farrowed.

There is nothing complicated or prohibitively expensive required in giving bred sows the proper care and feed, but it does require some time and attention spent on the every day tasks that are so easily overlooked or neglected.

Lanolin—Ancient and Modern Beauty Aid

Condensed from the Sheep Breeder

NERO's physician wrote of it in the materia medica of the day. Roman matrons made lanolin as a prized household task.

This Christmas thousands of women received a gay, bright-as-holly, little makeup kit, complete with three lanolin cosmetics—lipstick, rouge, "Lanocake."

This clever newcomer, "The Kiltie Kit," brightly apparelled in a Botany Tartan Scotch plaid and smartly fitted with a zipper closing, adds a fillup to a famous group of lanolin-based cosmetics now on the market.

Modern as tomorrow, lanolin cosmetics in their streamlined packages such as the Kiltie Kit are nevertheless merely proof again that we moderns are really borrowing from antiquity's beauty aids that were old when Egypt was young, and that somewhere along the path of time were lost and are now found again.

It was not much more than a decade ago that we began to hear about the marvels of lanolin—a "new discovery." Almost overnight lanolin medicinally and in cosmetics became Big Business, and today demand for it is steadily increasing.

But public knowledge to the contrary, 20th Century womanhood is by no means the first to pay tribute to lanolin, the mysterious soluble wax which most nearly resembles the natural oils of the human skin. Novel containers and the fresh colors and dainty perfumes of the cosmetics themselves are new—but lanolin is as old as mistletoe.

Dioscorides, Greek physician to Nero's Army, so esteemed lanolin (which he called "Oisupon") that he wrote in his **Materia Medica** of the day full prescriptions on its production and its use. He recommended it as a healing balm for inflamed, cracked and injured skin tissue—whether it be a man's shin bone or the blemish on madam's chin.

The proud matrons of Nero's time, who enjoyed a freedom and suffrage almost as liberal as ours today, were no less vain than is the American woman of 1949. Beauty, however, came the hard way. Lack of sanitation, lack of beauty aids, and lack of personal conveniences all took their toll. There was a great need of an emollient that was both cleansing and healing—and a protection

Reprinted by permission from the Sheep Breeder, December, 1948, Chicago, Illinois

against the harsh sun and skin-drying winds.

The making of "Oisupon," or a rudimentary form of lanolin, became as much a part of Roman household activities as the weaving of cloth. Throughout the Empire, eager hands obtained this substance that could be washed from the wool of sheep, rinsed and stirred in earthen jars, and finally gathered up like butter from milk. Women stored it in gracefully turned amphorae and in beautifully decorated stone jars which could be warmed to make "Oisupon" flow freely when the soft cream was needed.

For hundreds of years—and in fact today among the Arab nations—Dioscorides' great tome on what is now known as lanolin was the physicians' prime guide for skin diseases. In the Western world this book was forgotten until the 16th Century when Goodyer, the great botanist of Petersfield, England, wrote out the entire Greek text with an interlinear translation, and then vainly sought a patron to support its printing. He failed and died. After his death, the manuscript lay idle in the archives of Magdalen College at Oxford until the recent past when Robert T. Gunther, a scholar of the ancient and the medieval, discovered it and edited it for publication. In 1934, the book, printed for the first time in English, was published by the Oxford University Press. The curious will find it in a few of the better stocked libraries of the land.

The modern beauty-seeker, however, needs no such book of prescriptions. She finds her lanolin cosmetics easily obtainable, and many thousands of times as pharmaceutically pure and delightful to use as Dioscorides' "Oisupon." Yet these cosmetics still have all the basic characteristics that made the earlier form the magic cosmetic of Nero's time.

Electric Litter Stirrer

Condensed from Electricity on the Farm

Stanley L. Burt
County Agricultural Agent, Massachusetts

ONE of the important factors in maintaining a dry floor in the poultry house during the winter months is to keep the deep litter from becoming hard packed. To turn the litter, poultrymen have used a fork and spent much time at this hard and disagreeable hand labor. The work is so time consuming that many poultrymen just do not get it done. The result is that dry litter is rare in many poultry houses, especially during a bad winter.

Why not let electricity do this work? So reasoned A. B. Ward, owner of Hillside Poultry Farm in Gill, Massachusetts. He has over 2000 layers to care for with all the necessary routine chores, plus the grading, packing, and shipping of hatching eggs. Ward felt there must be some easier way to break up litter in the laying pens. Giving his ideas to Clifford Harris of Bernardston, who is an excellent mechanic and welder, they jointly developed the electric litter conditioner.

A three-quarter horsepower electric motor mounted on a frame drives the stirrer reel by means of V belts. A 2 inch motor pulley drives a 5 inch pulley on the jack-shaft. In turn a 2 inch pulley on the jack-shaft drives a 5 inch pulley on the stirrer shaft. The stirrer is made of pipe with 10-5 inch teeth welded to it. It turns at about 280 rpm. There has been no trouble caused by getting litter in the belt drive.

Aluminum construction keeps the weight at a minimum. The rotating teeth dig forward into the litter, stirring it up in a swath about 18 inches wide and pulling the machine ahead. A metal shield keeps the whirling litter in place. By raising or lowering the handles on the machine, the operator has complete control of the depth to which the teeth penetrate. The machine weighs only 95 pounds and makes very little noise when in operation. While running, it is so quiet that the hens nearby pay no attention to it.

The building of this litter conditioner not only shows that electricity can do the job more efficiently but also proves that Yankee ingenuity is still at work.

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Phosphates from Ancient Animals

Condensed from Texas Farming and Citriculture

Rufe Daughtrey

THE bulk of the phosphate that is the basic ingredient of fertilizer comes from a small area in Central Florida.

Why? Because that small area is a veritable graveyard for the bones of prehistoric animals.

So unbelievably vast are these deposits of bone that geologists and phosphate men agree that mining can continue for another 100 years at the present rate. Last year Florida mined five and one-half million tons or 75 per cent of all the phosphate produced in the United States!

Whence came the bones to make these millions of tons of phosphate?

They are fossilized bones, and geologists reconstruct the story something like this:

Once upon a time in the misty dawn of history, Florida's Polk county (center of the phosphate area) was a shallow sea wherein romped the shark, the whale and the manatee.

The shores of this shallow sea quivered beneath the tread of the rumbling mastodon; saber-toothed tigers stalked its jungle fringes and the three-toed horse grazed on the highland plains.

Says E. T. Casler of the International Minerals and Chemicals Corporation:

"Streams and rivers brought the phosphate in solution into this shallow sea."

He added that:

"In our deposits we find phosphatized bones of such land life as the mastodon, saber-toothed tiger and the three-toed horse; and such sea life as sharks, whales and manatees."

Those old bones lay there for countless ages before man discovered them. It was in 1888 that a group of pioneer Florida explorers with some engineering knowledge discovered the phosphate deposits.

First phosphate was mined by negroes with shovels and mules with scrapers. Now the industry hires 4,000 employees, had a payroll of 13 million dollars last year, does its mining with giant draglines and ships out phosphate by the trainload.

And, incidentally, Florida's phosphate sales last year grossed 21 million dollars.

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* Short Articles.

For the Farmer's Library

Our Plundered Planet—By Fairfield Osborn, President of the New York Zoological Society. Little, Brown & Co. $2.50.

Lest we forget the earth as our source of life, this book demonstrates vividly and unsparingly that we are following a course which one day may render our earth as dead as the moon".

Malabar Farm—By Louis Bromfield, Farmer, Conservationist. Harper & Bros. $3.75.

Natural Principles of Land Use—By Edw. H. Graham, Chief, Biology Div., Soil Conservation Service. Oxford University Press. $3.50.

Soil Conservation—By Hugh Hammond Bennett, Chief, S.C.S., U.S.D.A. McGraw-Hill Book Co., Inc. $6.50.

Cities Are Abnormal!—Elmer T. Peterson, Author and Editor. University of Oklahoma Press. $3.00.

Successful Part-Time Farming—By Haydn S. Pearson, Farm Specialist. McGraw-Hill Book Co., Inc. $3.00.

Practical Farming for the South—By Benjamin F. Bullock, Prof., Rural Education, Atlanta Univ. Univ. of N. C. Press. $3.00.

The Business of Farming—By Herrell DeGraff, Prof., Agr. Economics, Cornell Univ., and Ladd Haystead, Journalist. Univ. of Okla. Press. $3.00.

The Farmer's Handbook—By John M. White, County Agent and Soil Conservation Specialist, Okla. A & M College. Univ. of Okla. Press. $4.95

Crop Management and Soil Conservation—By Joseph F. Cox and Lyman E. Jackson, 2nd Ed. John Wiley & Sons, Inc. $3.80.

Feeds and Feeding—By F. B. Morrison, Prof., Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $7.00 (Revised).

The Horse of the Americas—By Robert Moorman Denhardt, Editor, Western Horseman; foreword, J. Frank Dobie. Univ. of Okla. Press. $5.00.

The Horseman's Encyclopedia—By Margaret Cabell Self. A. S. Barnes & Co. $5.00.

Management and Feeding of Sheep—By E. T. Baker. Orange Judd Publ. Co., Inc. $3.50.

Raising Livestock—By Walter H. Peters, Chief, Animal and Poultry Husbandry Div., Univ. of Minn., and George Deyoe, Prof., Agri. Edu., Univ. of Ill. McGraw-Hill Book Co., Inc. $3.50.

Dairy Cattle Feeding and Management—By H. O. Henderson, Prof., Dairy Husbandry, Univ. of W. Va., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $5.00.

Dairy Science—By W. E. Petersen, Prof., Dairy Husbandry, Univ. of Minn. J. B. Lippincott Co. $5.00.

Animal Sanitation and Disease Control—By R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. Interstate Printers & Publishers. $3.50.

Successful Poultry Management—By Morley A. Jull, Professor and Head, Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $5.00.

The ultimate aim of government is not to rule, nor to restrain by fear, nor to exact obedience, but contrariwise, to free every man from fear, that he may live in all possible security; in other words, to strengthen his natural right to exist and to work without injury to himself or others. No, the object of government is not to change men from rational beings into beasts or puppets, but to enable them to develop their reason unshackled; neither showing hatred, anger, nor deceit, nor watched with the eyes of jealousy and injustice. In fact, the true aim of government is liberty.

Spinoza (1670)